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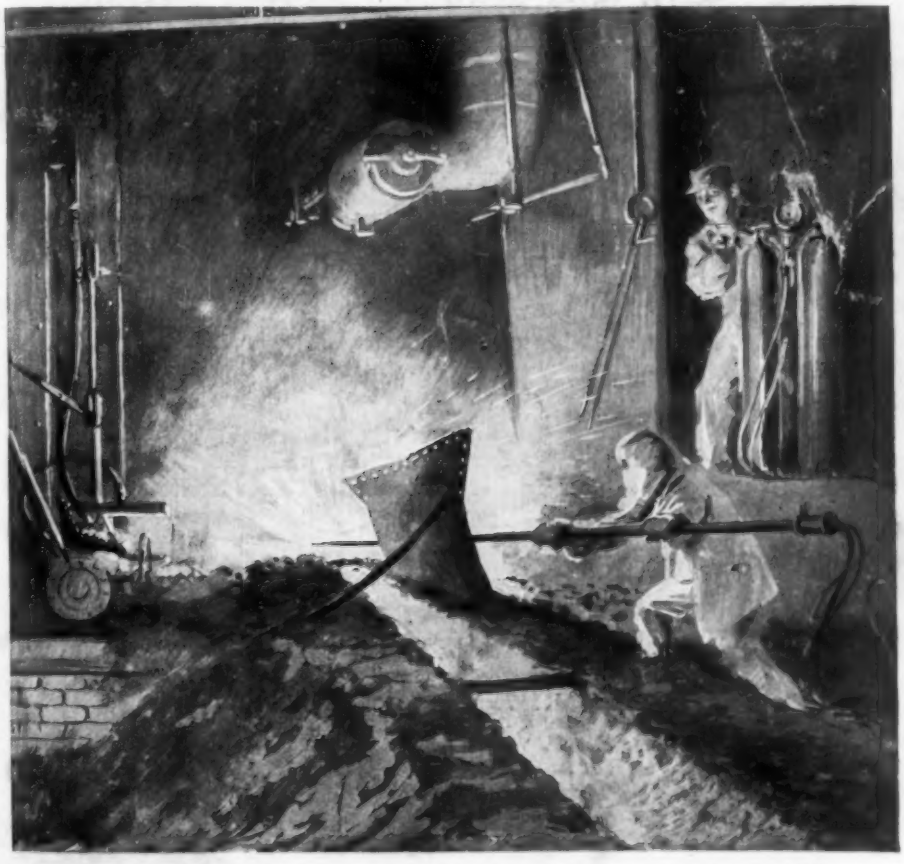

A Critical Moment—Reviving a Big Furnace with Oxygen Gas—See Page 303

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POPULAR MECHANICS

Vol. XI. APRIL, 1909. No. 4

NIAGARA'S POWER CURBED BY ICE

Appearance of American Falls During the Jam

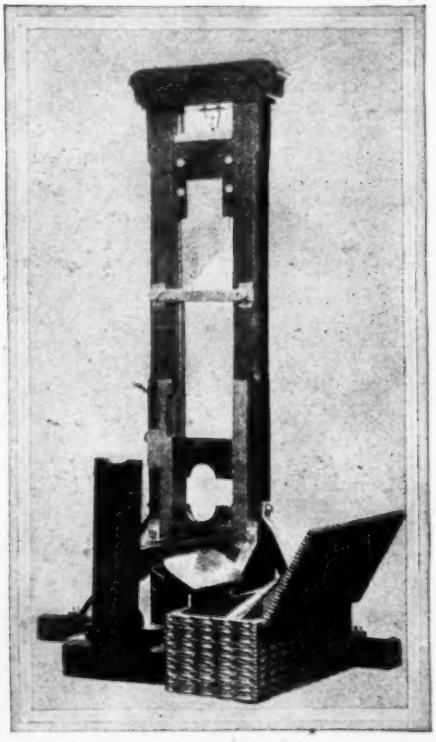
For the first time in modern history the power of Niagara has been effectually checked, at least on the American side, this remarkable condition being caused by nothing more nor less than its own frozen water. The photograph was taken from Goat Island, looking toward the American side, and shows the American falls almost completely blocked, its crest, usually a mighty volume of water, for the time being a passageway for pedestrians.

Although temperatures of 40 below zero have been experienced at the falls, such a jam of ice has never before occurred. The great amount of frozen slush ice, and a wind up river were responsible. The jam holding back the water did not start to form near the crest of the falls, but a considerable distance back in the channel at a point in direct line with the American mainland and the upper end of Goat Island.

On Feb. 16, as well as on a number of other days, pedestrians were able to cross at the point where the jam started, as well as on the very crest of the falls and along the ridge of ice in the gorge almost under the point where the great volume of water usually tumbles. During the period of the jam the water in the gorge was 40 ft. below its average level. The great electric companies which have harnessed Niagara on the American side fought the jam with dynamite in an attempt to keep enough water running to provide them with the required power.

FRANCE REVERTS TO THE GUILLOTINE

The great advance in the record of murders in Paris and other parts of France following the abolishment of



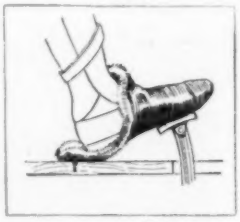
Guillotine Again Used in France

capital punishment has made it necessary for the French government to again set up the guillotine in an attempt to stem the tide. A number of murderers have already been put to death by this bloody instrument of execution, made so famous during the first French revolution, and the lower order of Parisians have gone mad with the blood lust. In view of the wild scenes that are taking place when executions occur it is probable that the French law which makes it necessary for executions to take place in public will be revoked.

To the Anglo-Saxon the idea of the electric chair or the hangman's rope is much preferable to the letting of blood in executions, but the French temperament is such that the former methods would not prove as effective in curbing crime as the latter.

OVERSHOE ATTACHMENT FOR AUTOMOBILE BRAKE

In winter automobiling all parts of the body need special protection, especially if the machine is running at a high speed against the wind, but no one part needs more protection or is surer to become cold than the foot that works the brake. The



padded overshoe shown in this illustration is ample protection for this member. The heel is screwed fast to the footboard, and the shod foot of the driver of the automobile is simply slipped into it.

INGENIOUS DOOR-STEP SHOE-CLEANER

The ordinary door mat is something of a nuisance, although better than none at all. The dirt works through and litters up the porch or hallway, and

New Shoe Cleaner

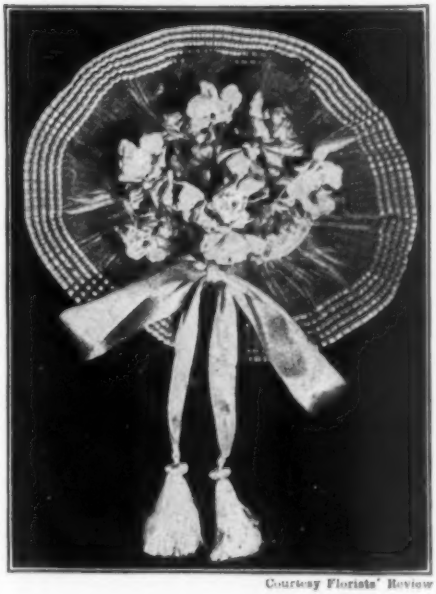
its scope is confined to the bottoms of the shoes. This device is a door-step cleaner which will remove the dirt from all parts of the shoe. The foot is passed back and forth between the brushes, and the dirt and dust drops into a little drawer at the bottom. This is withdrawn and emptied when full.

NEW TYPE OF PARACHUTE

The parachute in its present form has been used for many years without any material change in its construction. It is a large disc of canvas or cotton fabric with a good sized hole in the center, and ropes passed over it to sustain the weight of the body whose fall it is to retard. The disc diameter to carry one man should be 30 ft. when arched out. The rate of fall depends upon the size of the hole in the center, for the parachute is governed by the velocity of the air escaping through the opening. If the opening is too small, the air will escape around the outer edges and cause the parachute to oscillate dangerously; if too large the fall is not sufficiently retarded.

It is this problem that the inventor of the parachute shown in the illustration has solved. He enlarged the opening and attached a second small parachute over the opening. By this means the escaping air reacts on the small parachute and adds largely to the retarding of the drop.—By Rankin Kennedy in Aeronautics.

It cost about $130,000 to bring the American fleet of world-girdling battleships through the Suez canal.



Courtesy Florists' Review

CORSAGE BOUQUET SHIELDS

The corsage shield for bouquets of violets or other flowers has a body and handle composed of fibre, covered with satin and surrounded with lace or plaited silk chiffon with satin edges. When the bouquet is in place the shield is covered, the lace or chiffon forming a rich background. One of the features of the shield is that its handle is fastened to the dress, not the stems of the flowers. The bouquet is tied to the shield with ribbon or silk cord.

OCEAN TUBERCULOSIS SANITARIUM

Plans are being discussed in England to provide an ocean sanitarium for tuberculosis. The suggestion is to fit up a sailing vessel of about 2,000 tons, for not more than 50 patients, each to be provided with a large, private, and well-ventilated cabin. The deck would be used for what is commonly called the "veranda treatment." If the plan is carried out, the ship will cruise in the neighborhood of the Canaries, where it will have the advantage of the trade winds and an even climate.

SCALES FOR WEIGHING BABIES

If there is a baby in the house it is wise, according to medical men, to have a pair of scales at hand so that the infant can be weighed regularly every day. The scales shown in the illustration are made especially for this purpose, being fitted with a dainty wicker

For Exclusive Use of the "Boss"

basket for the infant to rest in, and a white enamelled indicator arrangement which is in keeping with the rest of the equipment. Any kind of scales will do, of course, but these are specially designed for the purpose.

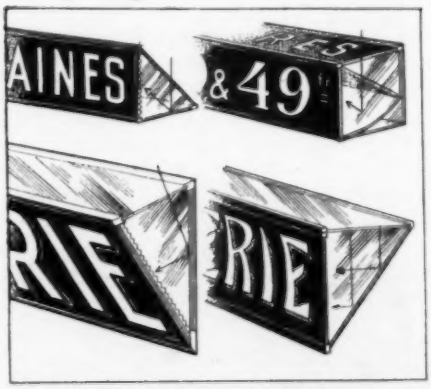
The infant should increase in weight gradually, for a moderately fat baby is in better condition than a very fat one. But the main point is that the infant should not lose weight. In usual cases a doctor is not necessary when the scales show a small but steady addition of weight as the days pass, but if the scales indicate a loss of weight the doctor is a wise precaution.

ILLUMINATING SIGNS WITHOUT COST

Gathering up second-hand light that is lying around loose in a street and using it for illuminating signs is possible if the sign in question is of this type. The device makes use of prismatic glass and reflecting mirrors in such a way as to gather up the diffused light from street illumination by night or from the sky by day and concentrate it upon the sign. The result is illumination startlingly like that of a sign lit by electric or other lamps. One of these signs, consisting of one letter, placed at the fifth story of a Paris building, appears exactly like one of the luminous letters of the large signs we are all familiar with.

Take, for instance, a sign intended for the front of a store. The arrangement will have a triangular section, formed of a metal box, with one of the sides adjoining the right angle in front. This is a vertical glass plate, bearing the words of the sign. Behind this is a plate of parallel prisms. The oblique side of the triangle is a plate of thin glass, used simply as a protection, the light-rays traversing it and striking the prism-glass. Other rays fall upon a horizontal mirror and thence reach the prisms. Thus a series of light rays are collected and concentrated.

Very simple forms are made of a



Showing Arrangement of Mirrors

metal frame in which are set three parallel sheets of glass, one in front of the other and a prism glass. There is no mirror, but the prisms are turned toward the light, receiving it on their faces and condensing it even when the whole device is hung against a wall. Such an arrangement is inexpensive, and becomes luminous as soon as it is inclined at a proper angle to the light.

A bill prohibiting the wearing of hatpins more than 10 in. long has been passed by the Oregon legislature.

AUSTRALIA MAY HAVE GREAT OIL FIELD

The most important development in the small business of oil production in Australia is recorded at Roma, North Queensland, even though the assistant state geologist reported that he had been unable to find any indications of oil in that district. The drill of an oil company struck a large volume of gas, which immediately ignited. The flame from the hole burned furiously for a week, shooting 80 ft. into the air with a roar and dazzling glare which caused the residents of Roma to consider evacuating the town. The day after the fire started oil began to exude in small quantities, and in a day or two the flow was considerable.

EMERGENCY JACKETS FOR SUBMARINE CREWS

Many different kinds of devices to make it possible for the crews of submarines to reach the surface safely and float there in case of accident are being experimented with, but none seem to be more feasible than the combination rubber helmet and coat being tested by the crew of the U. S. submarine "Octopus". It is easily put on and fastened over other clothing and contains enough air to float the wearer quickly to the surface and make breathing possible for a limited time. Provision is made for opening the helmet quickly on reaching the surface.

Device for Saving Submarine Crews

A BOY-GIRL FANCY DRESS COSTUME

There is hardly a fancy dress ball given that some man does not bedeck himself in the finery of a woman and that a girl does not appear in the more or less modern habiliments of a man, but it is quite certain that such a costume as this is not often seen at an American fancy ball. It is an in-

The Sex Is in Doubt

genious boy-girl costume, one half or side of the person being clothed in man's attire and the other half in a girl's. The idea is carried out to the minutest detail, even to the man's glove and walking stick on one side, to a woman's white lisle glove and a sunshade on the other. On one side of the head rests a man's soft hat and on the other a neatly coiffured arrangement of feminine hair.

ENGLAND'S CHAMPION ONE-ARMED GOLF PLAYER

These photographs show John Haskins, the champion one-armed golf

Snap Shots of Haskins

player of Great Britain, just finishing the execution of a long drive, and ready for an approach shot. Mr. Haskins will play in America this summer.

ROLLING SNOW-COVERED ROADS WITH AUTO

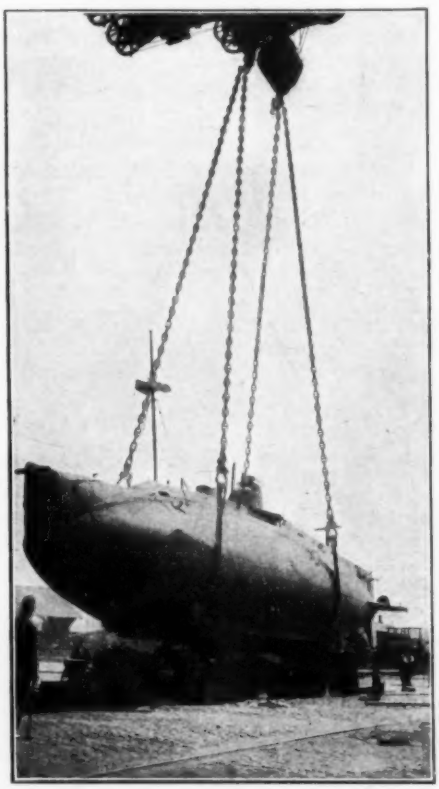
After a recent snow storm in Reading, Pa., in which the roads were left in a bad condition, an energetic manufacturer conceived the idea of attaching an ordinary land roller to his automobile, and started out to roll the road for the six miles between his factory and his home. A road commissioner accompanied him on the trip, which was made in an hour. The demonstration proved that a really fine winter road can be made by rolling after each snow storm.

In upper New York state the farmers roll the snow down by attaching two large iron kettles of the type used for making soft soap behind a team of horses or oxen. This method is not perfect, as it leaves a core in the center of the road.

More than one-eighth of the fires in New York during 1908 were directly traced to carelessness with matches.

LAUNCHING A SUBMARINE

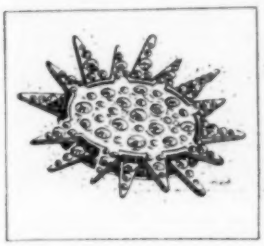
This submarine is the famous "Plunger" in which Ex-President Roosevelt took a dive off Oyster Bay. It is being lifted by the great 100-ton derrick at the New York Navy Yard preparatory to being dropped back into the water again after undergoing an overhauling.



Lifting an 80-Ton Submarine

A REVOLVING DIAMOND SUNBURST

An ingenious English society woman, Mrs. Paget, has had a diamond sunburst made to revolve by means of minute clockwork secreted in the back of the setting. The sunburst is set with overlapping rows of points, each round or set of points revolving on its own pivot. When the diamonds commence to revolve, one row of points over the other, the sight is truly dazzling. The sunburst will revolve all the evening without rewinding.



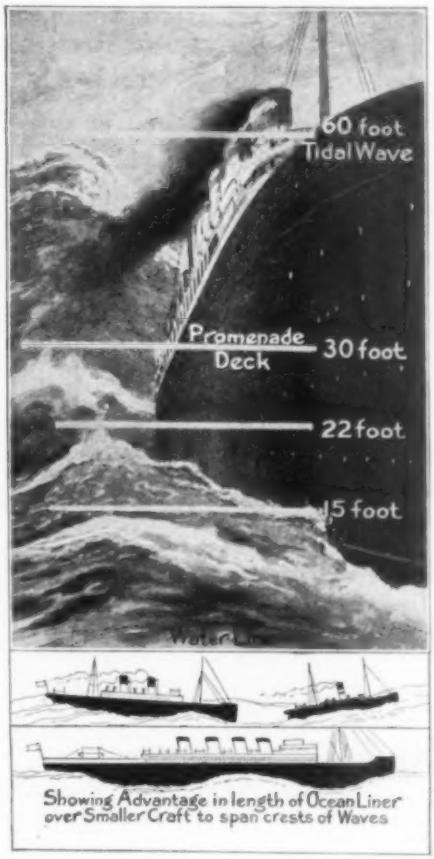
TRAPPING SPEED MANIACS AT NIGHT

Although the representatives of the law have succeeded in checking the speed of motor maniacs during the hours of daylight on many of the highways most frequented by automobiles, these restrained enthusiasts let out the notches as soon as night falls, secure in the knowledge that the stop-watch is not effective in the dark. To remedy this condition the automobile police of one municipality have been provided with the electric flashlight shown in the illustration. Standing with the flashlight behind his back, so that its glare will not be too pronounced, the policeman flashes it when an automobile enters the trap. The policeman at the other end of the trap sees the flash and catches the time of the automobile over the measured course. If the speed is in excess of the ordinance he flashes his own light, this being the signal for another policeman further down the course to intercept the machine. This he does by stepping into the middle of the road.

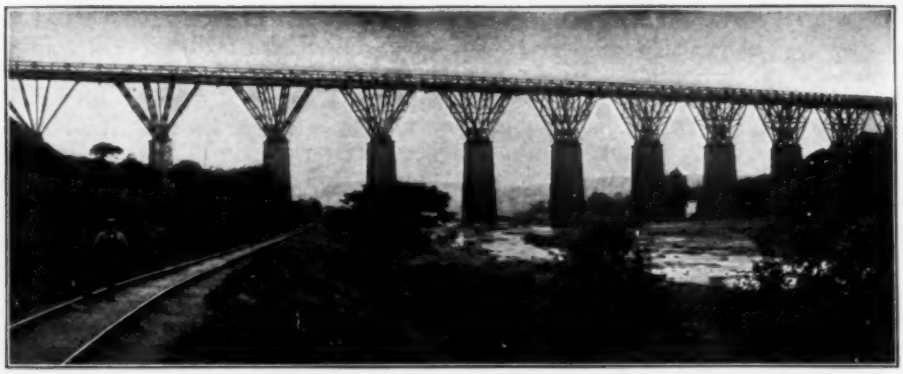
Flash Timing

THE SIZE OF OCEAN WAVES

The size claimed for waves in great ocean storms is often exaggerated, for science has shown that the biggest wave caused by a gale does not exceed 30 ft. Tidal waves have been known to reach heights of 60 ft., but they are an exception. With the increase of size of ocean steamers, the point of sight of the passenger has been raised, and it requires the roughest kind of a sea to



Height of Ocean Waves Compared with "Mauretania" and Smaller Craft



This photograph shows an interesting timber viaduct or bridge on one of the Cornish branches of the Great Western railway in England. The framework extensions on the top of the solid piers are curious.

show a broken horizon from the promenade deck of the "Mauretania" and her sister ship. In both, the pitch of the vessel is largely eliminated, although their decks, high above the highest waves of the most severe storms, have been washed by water thrown upward because of the opposition offered to the advance of a great wave by their hulls.

On the decks of the small steamers of past years, where the point of sight was low, the waves often appeared mountainous. The illustration shows how the illusion of "waves mountain high" arose.

THE RETURN OF THE WORLD-GIRDLING FLEET

The story of the triumphant return of America's fleet of powerful fighting ships after its wonderful world-girdling cruise of 45,000 miles is familiar to every American. The ovation will go down in history as the closing event of a history-making accomplishment that made the whole world applaud. An ovation as great as any ever accorded any fleet of any nation after great naval victories bravely fought and bravely won.

All the more does the fleet's accomplishment stand out because its mission was a bloodless one, directed against no warring foe, nor for any purpose of conquest other than that which brings nations and peoples in closer and warmer touch with each other through the potency of mutual admiration and respect. Such respect and admiration the fleet has gained for the United States in distant countries where her naval power was sometimes heard of, but oftener discounted because of the absence of demonstration. This is a reason in itself sufficient to have made such a cruise advisable, but the fleet's greatest victory was its mastery over self.

No matter how efficient the fleet was when it started out on its cruise the lessons learned have been many and wholesome. That of self-sustainment at sea is one of the greatest. The additional experience gained by every man, from the greenest recruit to the fleet commanders is another, and one that undoubtedly makes the 14,000 or more men who made the cruise as fine, if not a finer body of sea-fighters than any other in the world. Still another great lesson was economy of coal consumption. An authority of high degree in the fleet has made the assertion that in five years the amount of coal that will be saved on American battleships, as the result of economies that were learned and practiced on the trip, will more than pay for the entire amount of coal used from the moment the ships left Hampton Roads in December, 1907, until their return February 22, 1909.

As wonderful as the efficiency and deportment of the men was the mechanical and sea-going efficiency of the ships. Such a cruise means great wear and tear on battleships, but on the last leg of the voyage there were almost no minor breakdowns, a fact that is extraordinary. No serious accident marred the record of the cruise. Every part of the ships, including engines and boilers, behaved excellently. Among such repairs as were made necessary were many heretofore thought impossible on board ship, with a result that will mean greater independence of navy yards in the future. The tribute of President Roosevelt, now ex-president, as he welcomed the sailors home, is a fitting summing up: "As a machine of war the fleet comes home in better shape than it went out."

WIRELESS TELEPHONE ROOM OF U. S. BATTLESHIP

The wireless telephone equipment of the United States "battle fleet", which just completed its successful "round-the-world" cruise, is one of the most wonderful in the world. Conversations have been clearly transmitted from 25 to 50 miles distant. The illustration shows the wireless telephone room of the flagship "Connecticut." The flag officer is just about to send a wireless telegraph call signal to a distant ship. When this is responded to, the wireless phone will be used for conversation. The signal boy takes down the conversation on a pad.

The street railways in Birmingham, England, owned by the city, pay conductors $6.08 per week the first year, and $7.54 per week after the fifth year. Motormen receive a few cents more.

AMERICA RIVALS NORWAY IN SKEE-JUMPING

Although handicapped by the fact that there are very few natural inclines in America adapted to skee-jumping, thus necessitating the building of structures not unlike giant toboggan slides, the sport is gaining in the United States with great strides. In the northern parts of Norway and Sweden the

Wireless Telephone Room in U. S. Battleship "Connecticut"

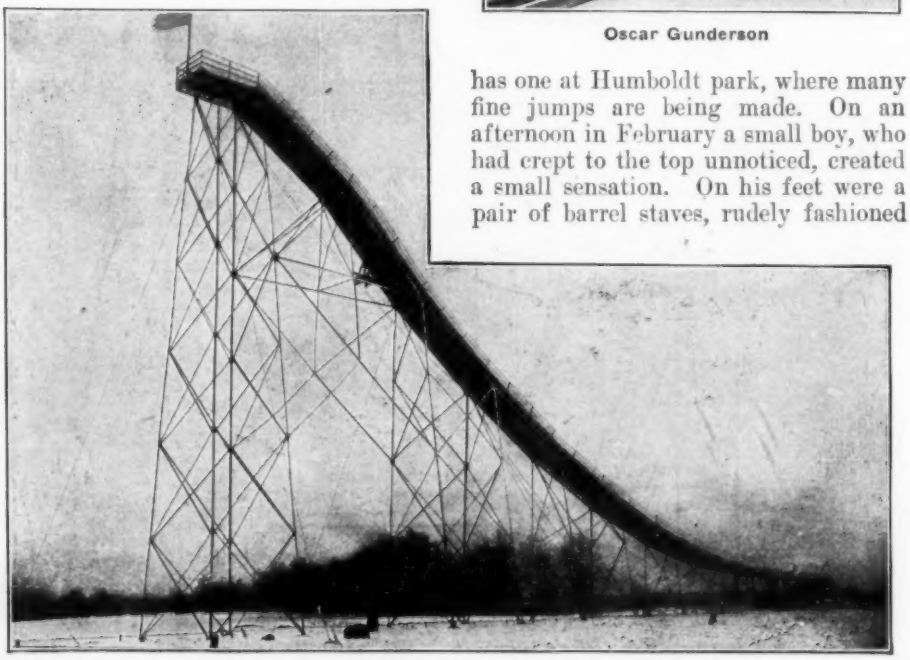
sport forms a part of the daily routine for nearly nine months of the year, and natural inclines are very numerous.

From the scaffolding shown in one of the illustrations Oscar Gunderson jumped 138 ft. in a scheduled tournament at Chippewa Falls, Wis., adding another great record to the long list held by American athletes. Mr. Gunderson's flight into the air upon leaving the scaffold was conceded by skee experts and enthusiasts to be as pretty a jump as has ever been witnessed. Pushing himself from the guard rails at the top he gracefully began the descent, gaining momentum at every foot until he had attained a terrific speed. As he reached the "bump" he crouched for the spring and suddenly raising himself he leaped into the air. Before alighting he propelled himself forward three times with his arms and body.

When the length of jump was accomplished a greater feat still remained. This was a successful landing and the crisis, for if the jumper falls it is a failure. For a moment Gunderson wavered as his body plunged downward, but by efforts which bordered on the superhuman he righted himself and continued down the slope past the "dead line."

Scaffolds for skee jumping are now being built in many states. Chicago has one at Humboldt park, where many fine jumps are being made. On an afternoon in February a small boy, who had crept to the top unnoticed, created a small sensation. On his feet were a pair of barrel staves, rudely fashioned

Oscar Gunderson



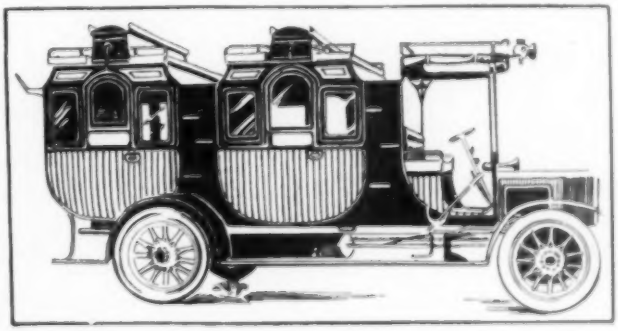
First Steel Slide Ever Built, Where Record Was Made

Making the Big Jump

into skees. He started down the incline with the dismayed shouts of a startled crowd of spectators ringing in his ears, but when he had accomplished a jump of some 40 odd feet, successfully, the dismay turned to admiration.

AN AUTOMOBILE STAGE COACH

This novel automobile body can in no better way be described than as a double automobile-coach, its shape and the outside seats reminding one of the early stage coaches. The interior is finished in the most luxurious manner, the roof being lined with bird's-eye maple, and the lower portion being upholstered in leather. Folding card tables, racks, pockets and cupboards are features of the interior equipment. The seats on top of the body are detachable.

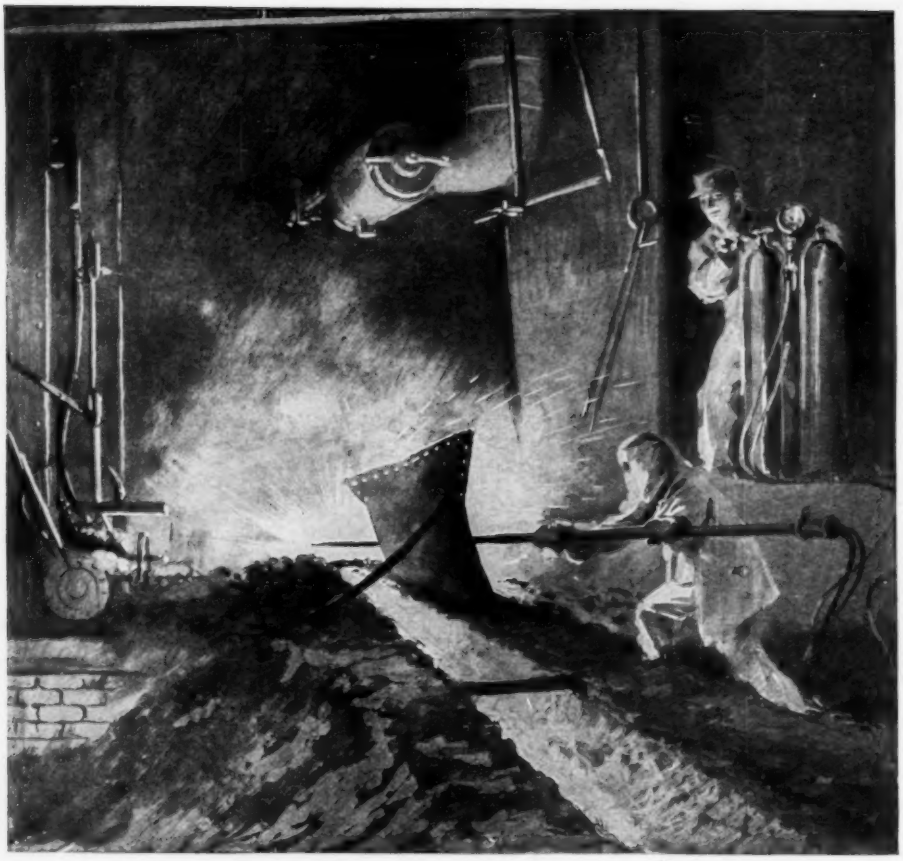


REMARKABLE OXYGEN MELTING PROCESS

A wonderful process of melting steel and iron, in which a blast of pure oxygen is the prime factor, has been invented by a German savant and tried out with remarkable results in both the United States and Germany. One of its uses is to clear the chilled iron from the taphole through which the blast is delivered to the interior of blast furnaces. A chilled taphole is one of the most serious troubles to be combated with in a steel mill. It can also be used to great advantage in cutting sinking heads on castings and cobbles, in dismantling and cutting up large castings, and for piercing steel plates. It is stated that at the Homestead works of the Carnegie Steel Company the oxygen outfit pierced an 18-in. armor plate in less than a minute.

The chilled iron that often blocks the taphole of a blast furnace can be pierced in a few minutes, even though the mass of metal has reached a depth of two or three feet. The chilled mass is first heated to combustion by the use of a gas flame and then the blast of oxygen is turned on. Under the high pressure of oxygen the molten mass is removed almost instantly, without any damage to the taphole.

All that is necessary for the opera-



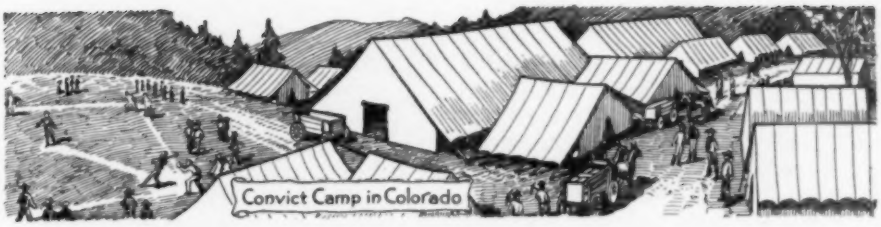
Tapping a Furnace with Oxygen Blast

tion of the process is a tank of compressed oxygen and another of coal gas. The blast of oxygen is directed against the metal through a long pipe-like nozzle, connected with the compressed oxygen tanks by hose. The heat is so intense that the operator who handles this nozzle must be clothed in an asbestos suit. Asbestos gloves cover his hands, an asbestos face mask and hood, fitted with an isinglass visor in front of the eyes, protects his neck and head, while a steel shield, placed midway between his position and the taphole of the furnace, helps to break the heat.

Many examples of the power of the apparatus have been given in American steel mills. In one instance a chill that had extended to a depth of nearly 5 ft., and had been worked upon by a gang of men for nearly two hours without success, was opened in four minutes with the expending of only 50 cu. ft. of oxygen. In less than two minutes, with about the same amount of oxygen, the molten metal was started running at the taphole of a furnace in Cleveland, Ohio. It was estimated that a depth of 4 ft. was pierced.

The tapholes of furnaces of the open hearth construction are readily opened in from 10 to 12 minutes, a most difficult operation, as the mixture consists of steel, slag, and magnesite.

If a cellar is dark, paint the lower stairstep white. This may save a fall and also relieve the strain of feeling for the last step when going down.



THE BUILDING OF ROADS BY CONVICT LABOR

Economical and Effective Improvement of Country Roads Made Possible by Convict Labor—Actual Road Work Means Fresh Air and a Closer Companionship for the Prisoner with the Invigorating Influence of Nature at Her Best—Also Solves in Part the Problem of Prison Labor

By Francis M. Buzzell

The problem of good roads, a cause championed for many years by the people of the rural and outlying districts of the United States, often with misdirected zeal, and the problem of prison labor, in which organized free labor has been arrayed in a bitter fight against state and prison officials, would not have seemed to have a close and vital connection a few years ago. But a general movement, now well launched in many states, and steadily growing in strength, means that the solving of the one problem will be the partial solution of the other. This movement is the building of good roads by convict labor.

The movement has not been devoid of strife, nor has the opposition come only from "convict" brokers and contractors. Criticism has come from public officials, and even from voters, who, although demanding better roads, fought the convict labor proposition strenuously. In the state of Alabama, for instance, the use of convict labor upon roads was, and still is, being fought with bitter opposition and the severest criticism, but opposition cannot long stand before the reasons in favor of the movement.

According to experts who have studied the problem of good roads and the problem of prison labor jointly, the building of public works which could not otherwise be undertaken is the sole occupation in which convicts can be employed which will not encroach upon free labor, and which will actually immeasurably increase the demand for the services of free labor, benefiting at the same time the criminal and the free man. No influence more destructive upon human character can be imagined than enforced idleness, while to allow the activity of the convict to be employed in making products for sale at prices below the normal market is degrading to American labor. Not only are these assertions made by those who have studied the subject, but also that there is no branch of public improvement of such general importance to all the people as the making of improved highways. The activity of the convicts in the United States constitute in the aggregate an enormous force, and how to use these activities most effectively in constructing highways is a vital question.

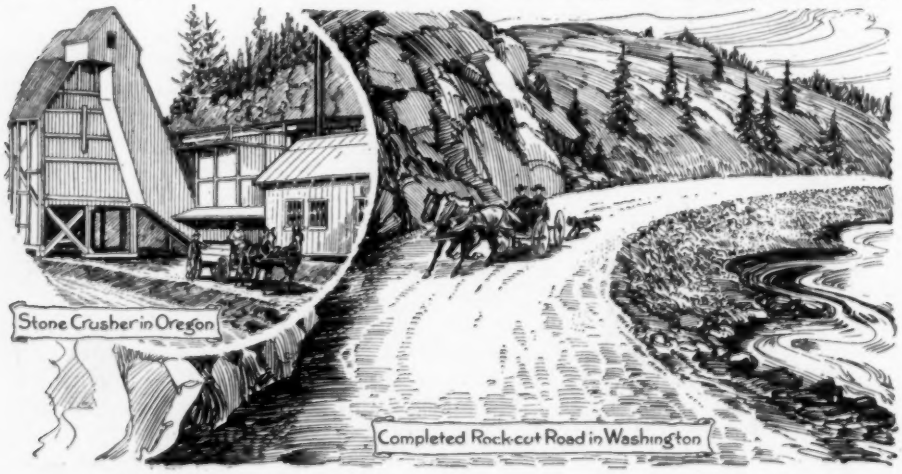
The list of states now using convict labor on the highways is too long to mention in detail, but Colorado, New Mexico and Wyoming are using such labor to construct a great highway which will run through the three states, and Washington, Oregon, North Carolina and Georgia, as well as several other states, have gangs at work. Illinois is using a number of her convicts in crushing stone for the roads, believing this one of the most practical ways of employing such labor

in road construction, although not as beneficial for the prisoners, perhaps, as actual road work.

The reports from public officials on the success of the movement in the different states are too lengthy, although vitally interesting, to be given here in full, but enough space must be allowed to give at least an idea of the cheapness with which roads can be constructed with convict labor, a few of the causes for opposition, and the methods of controlling the convicts while doing such work. The fact that it takes prison-confined men, be they petty or hardened criminals, into the open country where they gain a closer companionship with nature, is not the least important phase of the problem.

The convict road-gang at work in the southern part of Colorado numbers 88 men—enough to form a big company of soldiers. They toil peacefully through a magnificent valley near the New Mexican line, and the glorious beauty of their surroundings makes it almost inconceivable that among them are criminals whose names have been bywords in the criminal history of Denver, Pueblo and other towns of Colorado. Still more incongruous is this fact when it is realized that these men wear no distinguishing badge in the way of clothing, and that no armed guards are to be seen anywhere. If a man wishes to escape from such a camp it is conceded that he can easily do so, but that he may be overtaken elsewhere follows as a matter of course, and the penalty—one which is dreaded by any convict who has had a taste of open work—means that his activities will from then on to the end of his term be confined within the prison walls. Only five officers are in charge of the camp, which is composed of tents. The convicts sleep in one big tent, and during the day are divided into five gangs, each officer having charge of a gang. Eight hours of road work constitute a day's labor, and the men must go to bed promptly at 9 o'clock every night except Saturday, on which they are allowed an additional hour. Amusement is allowed to all in the camp. Some of the convicts own and are able to play musical instruments. Cards are also allowed. Some spend their time pitching quoits, and a ball game is usually played every evening before darkness sets in.

The method of guarding the convicts working on the roads in the state of Washington is a little more strict, but amusements are just as numerous. The provision allowing the convicts to do such work in that state was passed in 1907, and the point selected for making the first experiment was one of the most remote from the penitentiary, the idea being to give the new system the most severe test possible. The work selected was the building of a wagon road along the face of a nearly perpendicular rock bluff, the work involving the handling of a large



amount of dynamite by the convicts. The character of the rock encountered was extremely hard, making drilling very slow. Nevertheless, the average daily work accomplished by each man amounts to 2.42 cu. yd. of solid rock moved and 1 cu. yd. of earth and loose rock moved. As the lowest bid received for moving the rock was $1.50 per cubic yard and for loose rock and earth 40 cents, the average daily work of a convict was valued at $4.03. The camp established for the care of the prisoners consisted of a stockade, 80 by 125 ft., inside of which was erected a barracks, 18 by 48 ft. On the outside of the stockade and adjoining it, was built the guard-house. The number of convicts employed at the camp has never been more than 30, guarded by five officers. One of the illustrations shows this stockade, and another illustration shows a convict camp and stone crushing shed in Oregon.

A communication from J. M. Penn, judge of probate, Etowah county, Alabama, gives a clear insight into the conditions of convict road-building in that state.

"We have been using convicts upon the roads for a number of years," says Judge Penn, "against bitter opposition and the severest criticism, and are convinced that, if for no other reason, the benefit to the convict is sufficient to continue them at the work, even though we could have hired them out for mining purposes at $45 per month. But the injury to health, the severe treatment, as well as the association with the worst criminals, was sufficient inducement for us to keep them on the roads. Our convicts on the roads are only the ones convicted of misdemeanors for which no sentence is longer than two years for a single offense. We are now using about 40 such convicts, guarded by officers whose combined salaries do not amount to more than $180 per month. The gang is equipped with 16 mule teams, graders, scrapers, etc. The men are housed and moved from one part of the state to another in railroad cars built for the

purpose. We carry all equipment, including barns and blacksmith shop, with us. Bloodhounds are taken along to run down escaping convicts, but we don't require them more than two or three times a year. We have just completed a mile stretch of road on which we placed 3,862 wagons of gravel and rock. This stretch cost $696, including cement culverts, and it is safe to say that the same stretch could not have been made by any one else for less than $1,500."

As a contrast to the policy of the state of Colorado in not clothing the road workers in convict's garb the prisoners working on the roads of North Carolina wear the prison stripe, as is shown in one of the illustrations.

The building of good roads in Georgia by convict labor was brought about, not because of an irresistible popular sentiment for good roads, but because of the recent overthrowing of the "convict lease" system. There had developed in Georgia a system whereby the convicts were leased to "convict brokers" at a nominal sum. These brokers, in turn, leased out the convicts to the owners of mines, but the abuse of this system became so pronounced that an influential Atlanta newspaper started a crusade which resulted in an extra session of the legislature and the annihilation of the statute.

The employment of convict labor in crushing stone within the prison walls for road making is claimed to be one of the most practical methods of using such labor for road construction. As far as the construction of roads is concerned this method may be excellent, but the influence and good to the prisoners themselves is no different than that of any other occupation within the prison. As an argument in its favor, however, the Illinois highway commission, in its annual report, states that in most sections of the country there is a natural prejudice against exposing convicts on the public roads, contending that it does not seem justifiable to place the opportunity for escape so alluringly before the prisoner and to impose as a penalty on his very natural desire to escape the risk of being shot by armed guards.

STREET CARS HELP HEAVY LOADS UP GRADE

When a heavily loaded truck gets stalled on a grade on the street car tracks of Los Angeles the motormen do not become excited and use violent language, but calmly take a heavy plank, with which the forward ends of all the cars are equipped, place it against the offending wagon, and turn on the power. All the horses have to do is to keep out of the way, the cars providing all the power necessary.

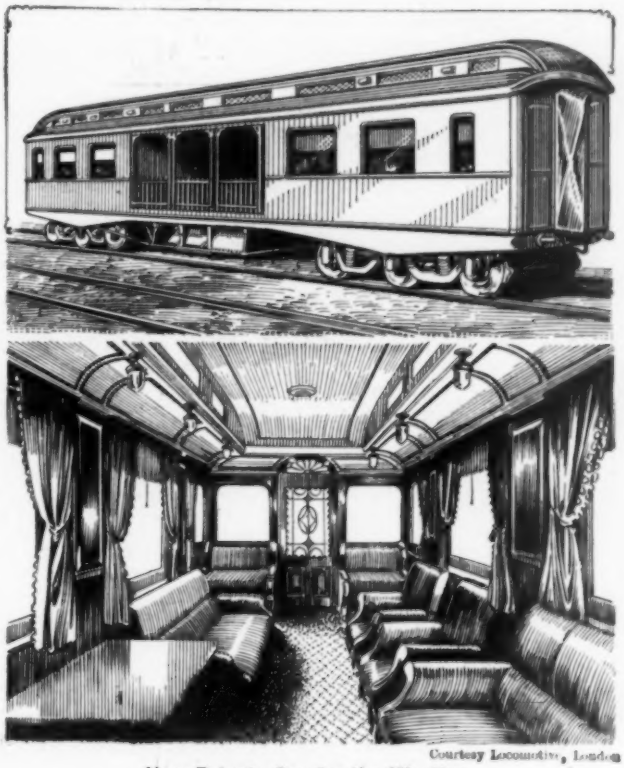
Sometimes drivers of heavy loads show consideration for their horses, if not for the street car company, by purposely running onto the tracks when grades are to be climbed so that the first car to appear will lend a helping hand.

A KHEDIVE'S PRIVATE CAR

The new private car constructed for the Khedive of Egypt, the title given the ruler of that country, has many interesting features, the most important being the observation platform. This

opens out of the center of the car instead of being at the end, as is the case on American railroads. A wooden screen jetting out from the forward end of the opening keeps the platform clear of flying dirt and dust.

The interior of the car is handsomely decorated and furnished. The body is framed in teak, covered with aluminium panels, and mouldings, the whole of the interior being painted ivory white, relieved by gilt lines. All windows and doors are fitted with dust excluders. The car is entered through the gates of the observation platform by folding brass steps. The platform divides the car into two apartments, one of which is for the Khedive and the other for his ministers.



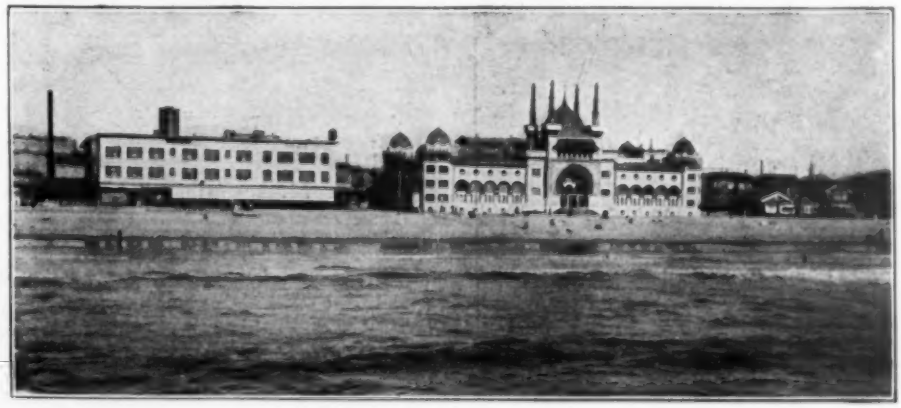
Courtesy Locomotive, London

New Private Car for the Khedive

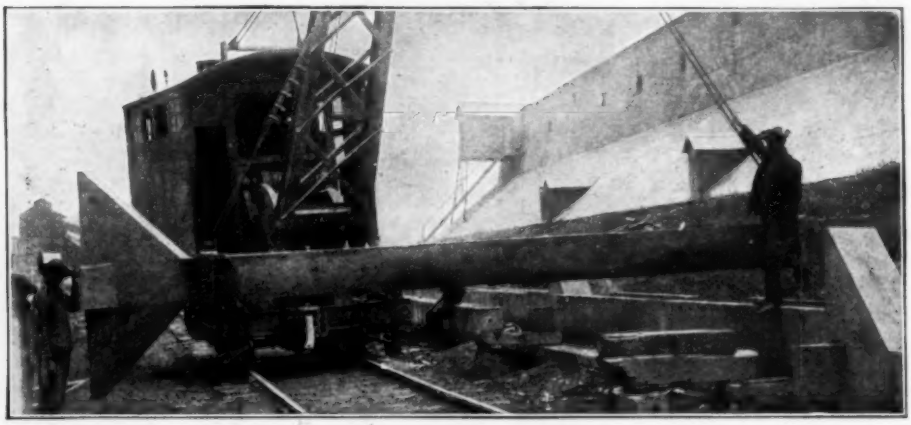
A CALIFORNIA BEACH

This illustration shows one of the numerous bathing beaches along the coast in California. The pavilion has 400 dressing rooms. A fee of 25 cents entitles a bather to a room, a bathing suit, and the use of the hot water plunge as well as the ocean.

In two recent night flights made by Henry Farman in his aeroplane he carried an acetylene light so that his course could be marked from the earth.

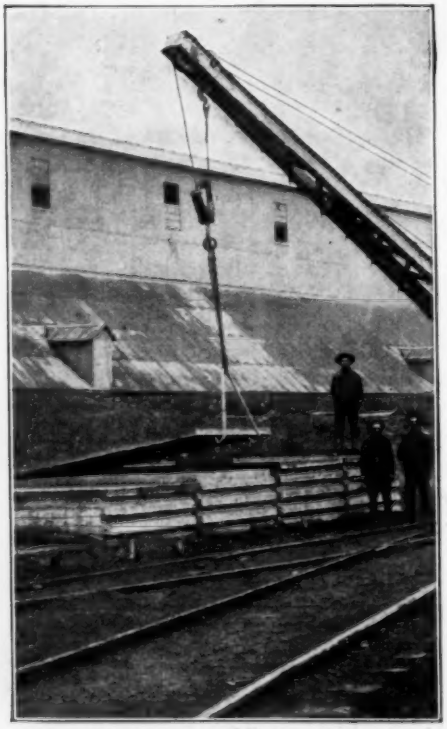


REINFORCED CONCRETE STRUCTURAL WORK CAST ON THE GROUND



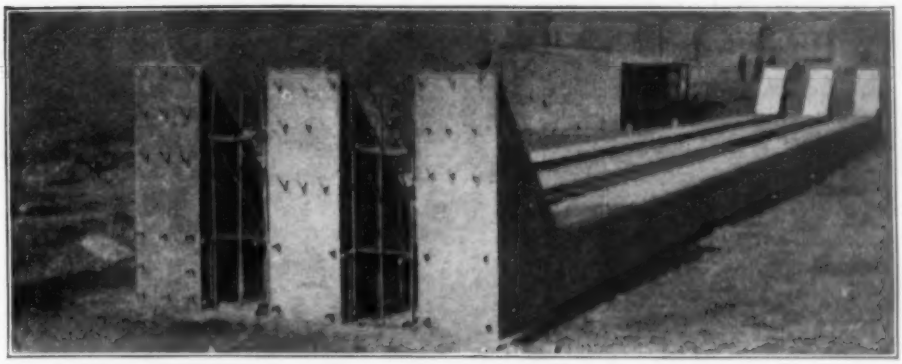
Reinforced Concrete Columns Cast on the Ground

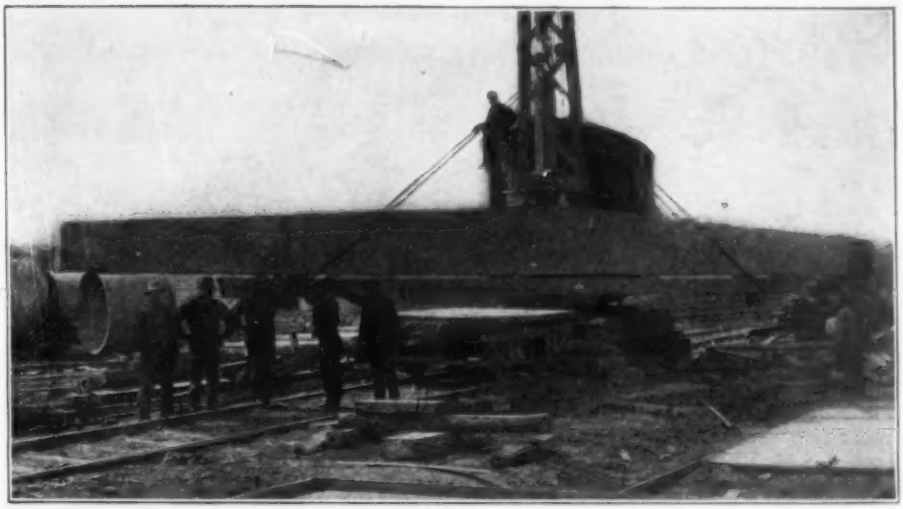
When reinforced concrete first became an important factor in building construction its application was direct, or, in other words, it was cast in the position it was to occupy in the structure. But gradually the idea of constructing reinforced concrete buildings by erecting separately cast members, such as columns, roof-girders, longitudinal struts, roof slabs, and other parts, all cast on the ground, has been adopted, until, as shown in the December, 1908, issue of this magazine, whole walls have been thus molded and tilted into position.

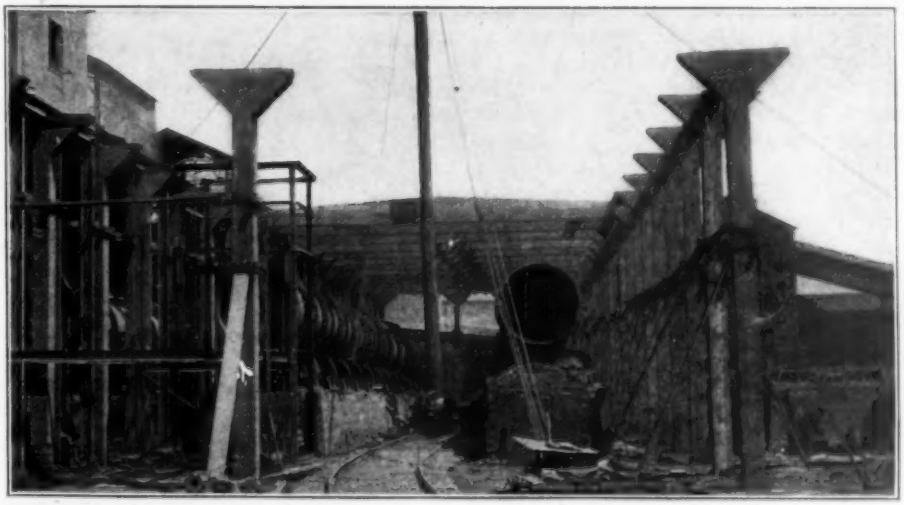


Concrete Roof Slabs Ready for Transportation

Five of the illustrations published with this article show the different parts of a reinforced concrete building erected at New Village, N. J., by this method of separate casting. The first illustration shows a derrick raising one of the 29-ft. columns from the casting bed for transportation to the building site. The second illustration gives a clear idea of the concrete slabs for the roof. They are 12 ft. long by 6 ft. 3 in. wide. The first illustration on the following page shows three of the side wall columns on their casting bed, the middle illustration gives an excellent view of the great 50-ft. roof girders, and the third gives the general appearance of the building with the columns set in place, part of which have been topped by the roof girders.



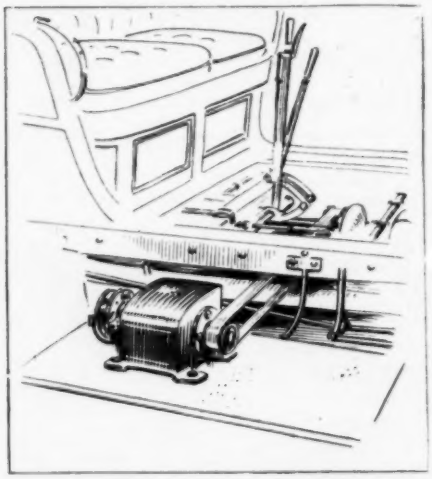




Side Wall Columns on Casting Bed—Some of the Huge Roof Girders—Concrete Columns in Position

ELECTRIC LIGHTING EQUIPMENT FOR AUTOS

Although the use of small dynamos for the lighting of automobiles is not new, this apparatus has a governing device which is unique in principle, consisting of the application of a series of make-and-break platinum contacts operated by a cam on the armature shaft. In addition to this there is a switch, which automatically connects the dynamo up to a battery consisting of six storage cells, keeping them fully charged so that light is as available when the car and engine are at rest as when running. This regulation is accomplished by the make-and-break mechanism, the cells beginning to fill when the speed of the dynamo suffices to generate 12 volts.



Small Dynamo for Automobiles

The dynamo is fitted on the running board of the automobile and is driven by a 1½-in. belt from a flanged pulley on the shaft connecting the clutch and gear box. The apparatus is enclosed by a detachable cover, and takes up no more room than the ordinary tool box often carried on the running board.

"Perflate" is a new word gaining a great circulation in England. It means to blow through and is used in the place of "ventilate."

THE FLOATING PALACES OF THE RAJAHS

To Americans, and, for that matter, the people of the progressive nations of Europe, who stay at home and busy themselves with keeping up with the times—a somewhat strenuous task at present—the entire world seems to be undergoing evolution at a speed which is almost frenzied, but after all North America and Europe are only a small part of the world. On some sections of the globe the dignitaries who lived and breathed one or two thousand years ago could come back today, if such were possible, and find many conditions with which they were familiar, although politically there has hardly been a country of any importance left unchanged.

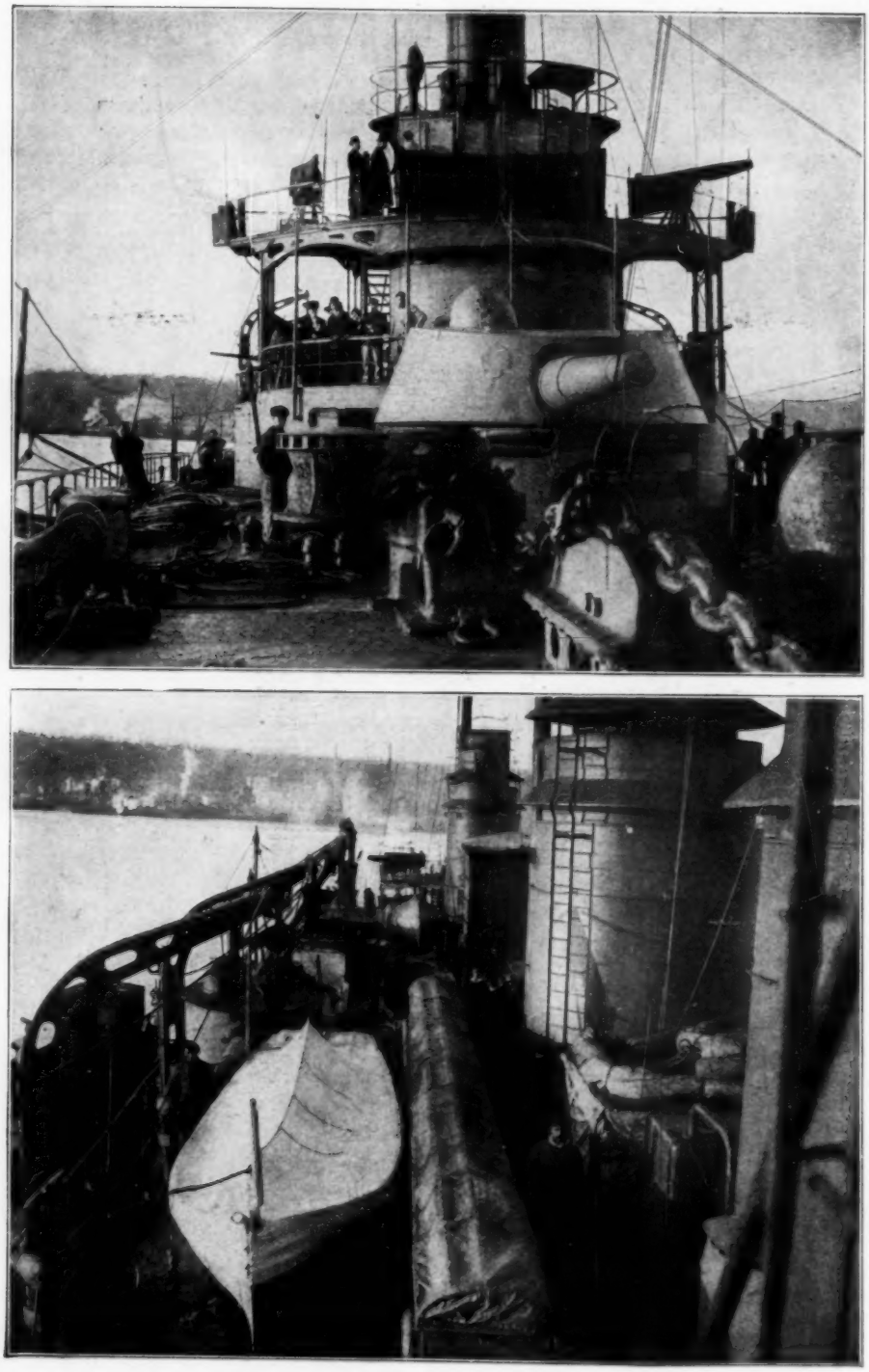
Notwithstanding the fact that India has for many years been under the rule of England, the conditions and manner of living have not greatly changed in many parts of it. On the Ganges river in the Northwest provinces, the tourist will see, if he approaches Benares at the right time, the same type of craft that carried pilgrims to this most sacred of Hindu cities hundreds of years ago. Three of the illustrations show modern floating palaces or magnificent galleys on which three Rajahs journey to Benares, and which serve as a test of their pious zeal. These galleys differ hardly an iota from the vessels used for the same purpose by Rajahs who died centuries past. Incrusted with gold, silver, and pearl, and decorated with tapestries embroidered with precious metals and jewels, these wonderful modern-ancient vessels lend a festive touch to the river scene. But their sumptuousness does not prevent the richest Rajah who possesses one, from bathing in the same water and surrounded by a half million poorer pilgrims, even though the sacred river is thus piously filled with myriads of microbes. And he will fill great jars with the water in which the pilgrims have washed their bodies, and drink it.

In contrast to these floating palaces

is shown one of the many barges of the poorer classes. The system of casts in India imposes upon the riverman the obligation of living on the water as his ancestors lived, so his shabby looking craft is also his home. Usually he has in his floating house a small chapel dedicated to a secondary divinity who personifies the river on which he exists.

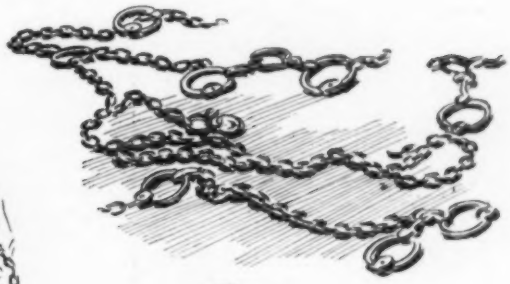
A temporary shutting down of the America-Niagara water-power plants showed that they only lowered the water level 2/5 in.

A Pilgrimage Galley with Silver Incrustations—Ingenious Galley Roofed Over Like a Pagoda—A Barge of the Poorer Classes—A Rajah's Galley at Benares



French Cruiser "Amiral Aube"—Recently in New York Harbor

Shackling his Wrists and Ankles



REMARKABLE SAFE-ESCAPE ACT

All acts of magic on a stage are tricks, many of which are very simple when you know how, but this act is one that has kept safe experts and the chiefs of many police departments guessing. The perpetrator of the act is W. H. Dilger, and the safe is always one borrowed for the occasion from some reputable business firm or safe company in the city where the act is being staged. The prisoner, for such Dilger is for a few minutes, is handcuffed and shackled about the ankles by the chief of police, if he will do this service, and then he is locked within the safe by the local representative of some safe company. In some instances the shackles have been placed around the ankles and riveted by a blacksmith. Three or four minutes later the prisoner is found outside the safe with the shackles and handcuffs held out in one hand for inspection. Dilger always gives orders to open the safe from the outside in case he does not escape within five minutes, as he would become insensible from want of air if confined longer.

Another interesting handcuff feat is

Liberates himself in Four Minutes.

Jumping Manacled into River

that of a performer known as "The Handcuff King." He dives manacled into a river, if one is available, otherwise into a pond, and remains below the surface of the water while freeing himself of his fetters.

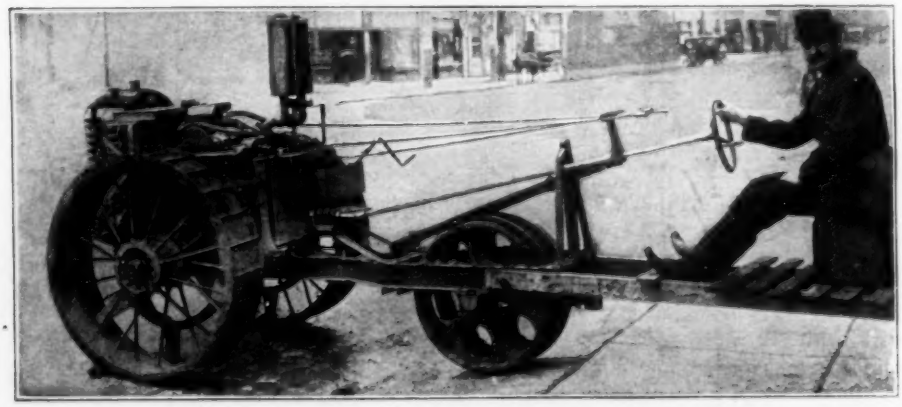
INGENIOUS MOTOR TRACTOR FOR FARMING

This new gasoline tractor was suggested by the growing demand for a light farm tractor to take the place of the two, four, or six-horse teams used for plowing, harrowing, and hauling on western ranches. The special feature of the machine is that it may be driven from the seat of the ordinary wheel plow or harrow, enabling one man to drive the tractor and to operate the levers of the tilling implement at the same time.

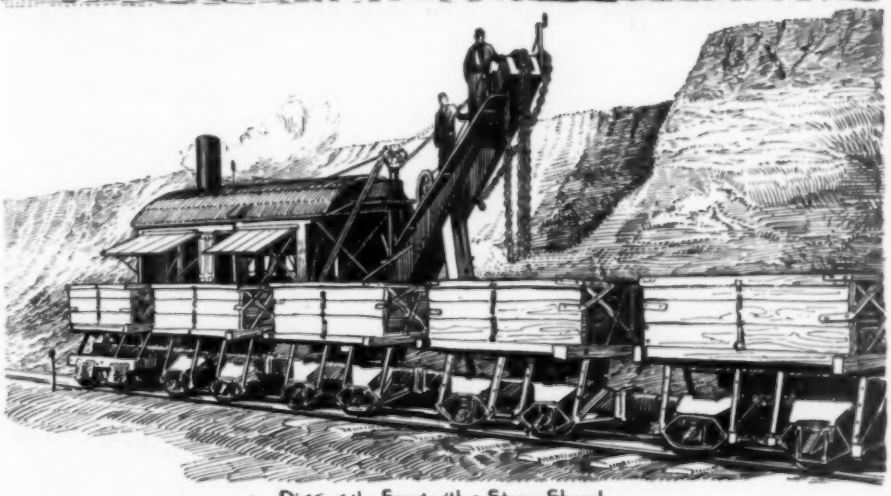
The machine is particularly an orchard tractor, having low, wide wheels, narrow tread, short wheel base, and a short running radius. To obtain the greatest efficiency the front wheels are the traction as well as steering wheels, a novel departure in this type of machine. It sells for $1,000.

WEALTH STORED IN SAND

Throughout the southern counties of New Jersey great stretches of glass sand are found, affording the material most in demand for the manufacture of flint glass and furnishing a livelihood for thousands of glass workers in both bottle and plate glass factories. To the northward, in Burlington county, chiefly along the banks of the shallow Rancocas river, there are great banks of building sand, with an occasional deposit of the more valuable sand needed in the filtration plants of large cities. A fortunate purchase of a deposit of the latter by a Pennsylvania railroad conductor has enabled him to retire to enjoy the pleasures of auto-



New Type of Farm Tractor



Digging the Sand with a Steam Shovel

mobiling, with an occasional ride in a special train over the very rails over which he collected tickets for many years.

Farms around Hainsport that a few years ago were yielding their owners only a meagre living now are amassing fortunes for those wise enough to retain the titles to them. It is an easy matter for the sand to be scooped out by great steam shovels, and run through washeries to remove the decayed vegetable matter before being dumped into scows or railroad cars. It is not unusual for scores of these mines or diggings to ship 16,000 tons of sand in a day, and the mining is carried on by truly scientific methods, borings being made frequently in search of more valuable deposits underlying the surface sand. New diggings are being continually opened, but the great supply of valuable sand seems almost inexhaustible.

AMMUNITION SUPPLY SHIPS FOR NAVY

If the recommendation to be made by Rear-Admiral Mason, chief of the Bureau of Ordnance, is adopted the United States navy will have two ammunition supply ships, one for the Atlantic and the other for the Pacific. These ships would be virtually floating naval magazines. The necessity for such vessels was clearly shown in the recent cruise of the fleet. It was found difficult to get explosives to the ships through other transportation means than colliers and storeships, which was considered unsatisfactory.

MANUFACTURING SALT WITH BESSEMER PROCESS

It seems a far cry between the manufacture of salt and the manufacture of steel, yet, by a new method, the Bessemer process is now being used for the former as well as the latter. Dirty rock salt is discharged into special furnaces and quickly converted into a molten condition. It is then run into a receiver through which a current of compressed air is forced, causing all the impurities in the molten mass to either be blown away or forced to the bottom of the vessel, leaving an almost transparent liquid. The latter is poured off in moulds and allowed to cool and solidify, forming a block that can be sold in this condition as rock salt or can be broken up and ground in the various sizes required for domestic use.

Salt thus turned out is not only thoroughly cleansed, but bleached as well. The extent to which the cost of salt manufacture is reduced by the converter is claimed to be great, it being asserted that by the evaporation method a ton of coal yields only 1½ tons of salt, while the new method yields 15 tons of finished salt for each ton of coal used.

The ordinary process of salt manufacture, and one which has been used for many centuries, is the discharging of the quarried salt in water, together with its numerous impurities, and the running of this mixture into evaporating pans. Fire beneath the pans evaporates the water, and some of the impurities, leaving the deposit of salt.

Courtesy Knox Auto Co

Ready for a Run

NEW YORK'S NEW AUTO FIRE WAGON

An interesting test was recently made of New York's new automobile fire wagon by linking it with the high pressure service. The test was made at the foot of Gansevoort street, with the fire boat "Thomas Willett" supplying the pressure through two leads of high-pressure hose. Under a test of 300 lb. pressure the swivel nozzle of the fire wagon threw a powerful stream a distance of 125 ft. at all angles, from directly upright to directly down, and sweeping entirely around the compass.

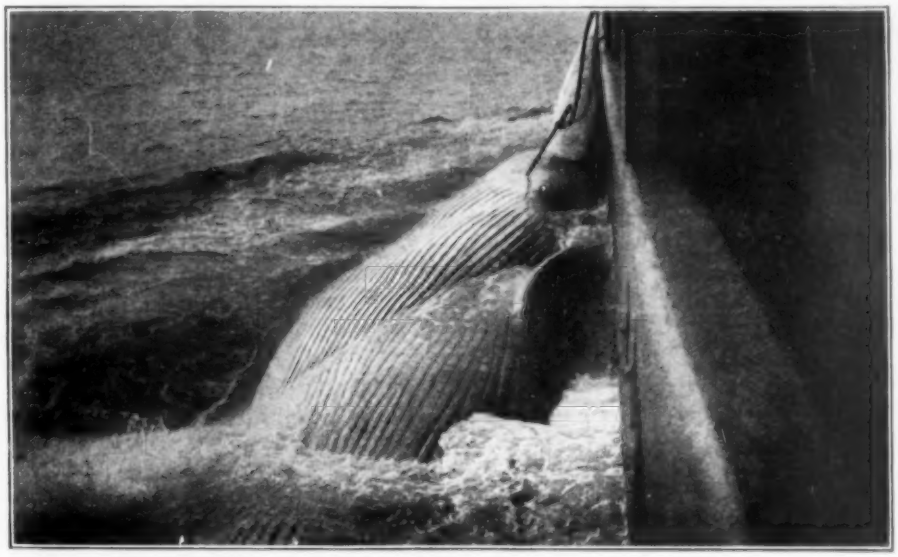
The apparatus, which was built to order, weighs 5 tons, and is guaranteed to carry a load of 5 tons and run at a speed of 30 miles per hour over city pavements. One of the most interesting features of the test was the run through the streets, with Fire Chief Croker watching the handling of the wagon from his automobile, which followed. The speed made by the fire wagon down Broadway and Fifth Avenue to 12th Street was 26 miles an hour, its siren warning horn giving it a clear track and drawing crowds to all the cross walks. Twenty firemen were on the wagon during the run.

The trip of the auto fire wagon from the shops at Springfield, Mass., to New York was made overland, the machine being halted a few hours in all the larger towns en route to give demonstrations of its fire-fighting power.

WHALING WITH MODERN METHODS

[Condensed from World's Work, London]

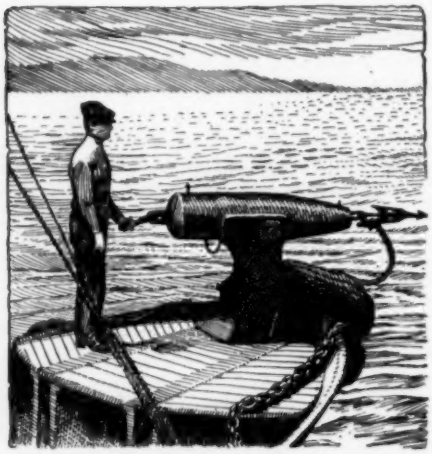
Whaling with modern methods in Alaskan waters is an exciting game, especially for those who are new to the business. The modern whaling steamer is a little vessel almost round on the bottom, which enables it to be turned and managed with the greatest ease. Mounted at the bow is a small cannon that shoots a harpoon weighing more than 100 lb., and having an explosive head, called the "bomb." If the shot is a good one and the harpoon is planted squarely behind the fin, the bomb crashes into the lungs, killing instantly; if not, the struggle may last for several hours.



Inflating a Dead Whale with Air

The description of the capture of a "finback" whale is given in an interesting manner by Roy Chapman Andrews in The World's Work, London. Mr. Andrews was hunting whales with a camera.

"The first whales we sighted were only two miles away, and soon we were so close that the loud, whistling "whooo-oo" of the spouts could be plainly heard, as they blew and went down, leaving a long patch, or "slick" of smooth water where they sank. We stopped over the slick left by the largest of the whales, and lay gently rolling from side to side. Sorenson, the gunner, stood as rigid as a statue behind the harpoon-gun, swinging the muzzle slightly from side to side, ready for instant action. Fifteen minutes had passed, when, way off on the starboard quarter, rose four spouts of white vapor almost together. The steamer was got under way and swung in a long circle, but the whales were down before we reached them. The vessel again stopped on the slick where they disappeared and again began the tense strain of waiting. Six minutes passed and then in four emerald-green patches only 20 ft. away the water began to boil. The gunner, half stooping, swung the heavy gun about and sighted along the barrel at a great purplish body, arching itself for the dive. Just as the fin came into view he pressed the



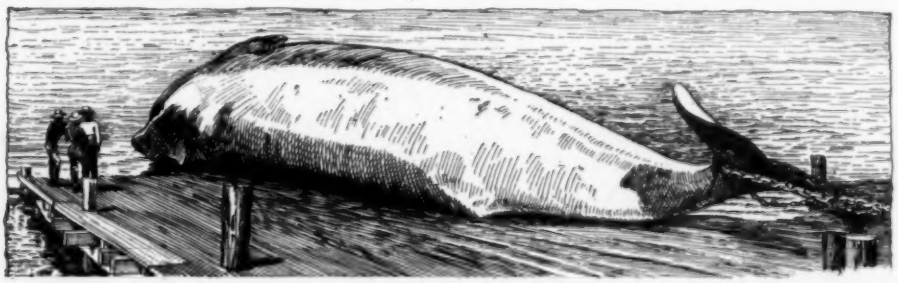
The Modern Harpoon Gun

trigger, the explosion shaking the little vessel from stem to stern. The whale sank in a swirl of green water, and an instant later we heard the muffled report of the bomb. The taut line hanging straight down from the bow told that the huge animal was dead with never a fight for life.

"Then began the work of bringing the whale to the surface and blowing it up so that it would float. Taking a hitch about a convenient post, the rope was slacked and run through a pulley-block at the mast-head to relieve the strain of raising the great body. The winch was set in motion and for 15 minutes nothing was heard save the monotonous grind as fathom after fathom of line was wound in. When the body was brought alongside the lobes of the flukes were cut off and lifted to the deck. Then a long coil of small rubber hose, one end of which was attached to a pump and the other to a hollow, spear-pointed tube of steel with perforations along its entire length, was brought into play. The spear was jabbed well down into the whale's side, the air pump was started, and the body slowly filled with air. When inflated sufficiently to keep it afloat, the tube was withdrawn, the incision plugged with oakum, and the chains cast off. A buoy with a flag was then attached to the carcass, and the whole set adrift to be picked up at the end of the day's hunting."

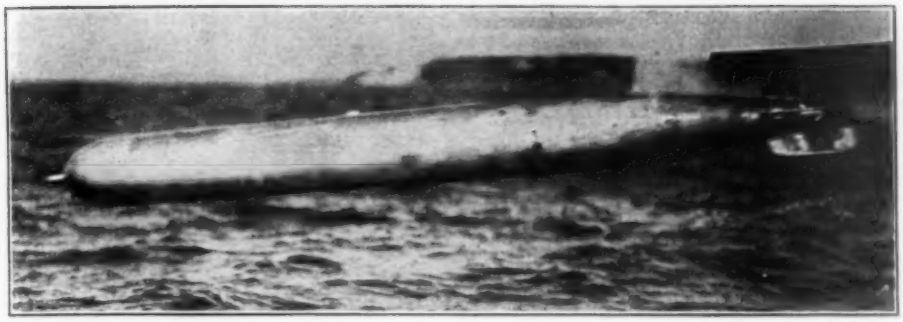
The whaling station is a group of buildings, situated in a bay or cove near enough to the feeding grounds to allow the steamer to come in each night with the day's catch. The whales are anchored at a buoy in front of a long, inclined platform, upon which they are drawn tail first by means of a steam winch.

The saying that every part of the pig but the squeal is now of market value is also a fact with the whale. Not a particle of the animal is wasted. After the skeleton is stripped of flesh it is disarticulated and the bones chopped in pieces. The blubber is "tried out" for oil, and the meat and bones are boiled for the same purpose. Later the flesh is artificially dried and sifted, making a fine guano, and the bones are ground up for fertilizer. Even the blood is boiled and dried with the flesh, and the water in which the blubber has been tried out makes excellent glue. The fins and tail, after being sliced into thin strips, are salted and barrelled and shipped to Japan as an article of food.



Courtesy World's Work, London

Drawn Up on the Slip Tail First



NEW U. S. TURBINE TORPEDO

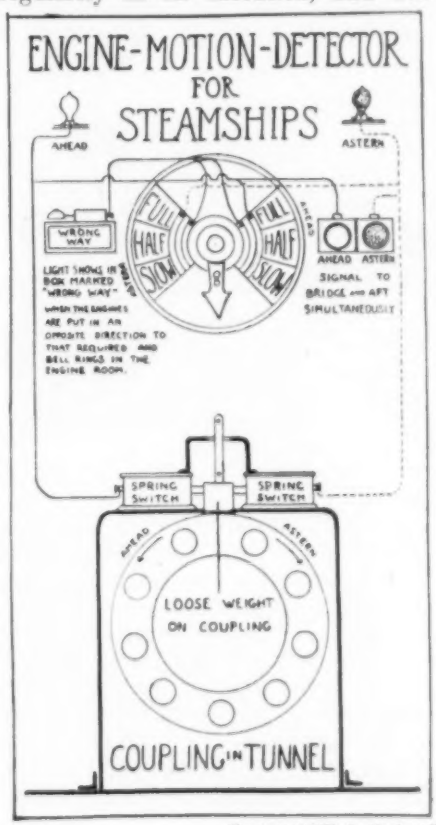
This illustration shows a deadly torpedo starting on its mission of destruction. It is one of the new 21-in. turbine torpedoes of the U. S. navy, and has just been fired out of the tube of the "Morris" at Newport, R. I. The range of this torpedo, which is sometimes called an "automobile turbine torpedo," is 5,000 yd., nearly three miles. The cost of the new torpedo is $5,000, and it will be made at the new government factory at Newport.

ENGINE-MOTION-DETECTOR FOR STEAMSHIPS

Many accidents at sea have been traced directly to wrong interpretation of orders issued from the bridge to the engine room, a cause of trouble which is claimed to be almost impossible if the ship is equipped with the new device here shown.

The general arrangement and operation of the device can be readily seen in the illustration. It consists of a switch at either side of a weight resting on the coupling of the tunnel shafting. The shaft, in revolving, tends to throw the weight sideways, this movement putting into operation a switch which lights an electric lamp. When the shaft ceases to revolve, a spring pushes the weight back into place and the light goes out, and if the shaft is revolved in the opposite direction the weight swings in that direction, thus lighting another lamp, or series of lamps. It is obvious that if one lamp, or series of lamps, is red and the other white, only one series of which can be alight at once, that the direction in which the shaft is revolving can be at once detected in any part of the ship where a signal lamp is installed.

With such a device, the navigator of a ship, in giving an order to the engine room, can at once detect any irregularity in its execution, and will



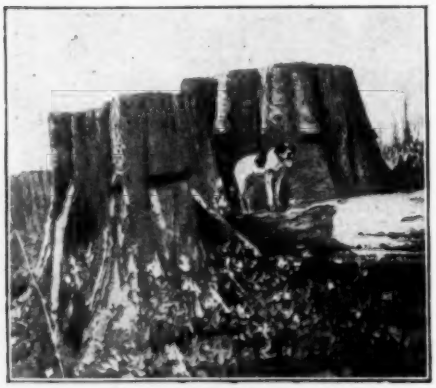
Courtesy of "Marine Engineer"

have time to warn the engineer that he is not obeying the order before any damage is done, whereas at present he has to wait and watch the result of his order in the movement of the ship.

In one system recently installed, not only do the signals on the bridge tell the captain whether or not his order to the engineer has been properly executed, but another set of signals arranged directly in front of the place occupied by the engineer who is working the engines tells him automatically if he has made a mistake. If the order indicated on the board is "go ahead" and he puts the engines astern, a large notice, "wrong way" is illuminated and a bell rings furiously.

SHINGLES FROM A TREE 1,100 YEARS OLD

A lumber company at Buckley, Wash., recently sent out a number of



A Tree 1,100 Years Old

souvenir shingles that were cut from a tree 1,100 years old. Scattered through the forests of Washington are gigantic cedar trees that fell untold ages ago and have laid buried in moss and decaying vegetation for generations. The moss upon these fallen monarchs has provided lodgment for seeds of other trees, and they have sprouted, taken root and grown.

The tree from which the shingles were cut is the one on which the dog is standing. Many people, without stopping to think, would say that the huge stump in which the tree is lying was part of a much more ancient tree, but they are mistaken by at least 350 years. The prostrate trunk has 350 rings, which fact denotes that it was 350 years old when it fell. The stump of the tree which grew over it has 750 rings, and as this could not have started to grow until some time after the first fell, it is practically certain that it was thriving in A. D. 800, which was 700 years before the discovery of America, and 300 years before William the Conqueror was crowned King of England. This tree grew, fell, and was lying covered with moss during the time of the third crusade, and nearly 300 years before the burning of Joan of Arc.—Contributed by W. R. Dickson.

BOTTLE FLOATED 33 YEARS

Bottles containing messages thrown overboard from vessels have been picked up after drifting about for long periods, but in all probability the bottle picked up last summer at a point in the Atlantic three miles south of Monomy Point, Mass., holds all records. The paper within the bottle stated that it had been thrown overboard from the ship "Hattie E. Tapley" April 13, 1874, a little to the eastward of the Cape of Good Hope. Capt. George H. Tapley, in command of the ship at that time, recently stated that when the bottle was thrown overboard the ship was on her way from Bassin, India, to Falmouth, England.

English Motoring Caps

The Reflectors Apparently Increase the 1800 Lights to 64,800

SALT WATER AS A WEED-KILLER

The Oregon Short Line railroad has been using salt water for ridding its roadbed of weeds, a process which is very inexpensive for that company because of its exceptional facilities for getting the brine. The water of the Great Salt Lake is approximately 22 per cent salt, and it is only necessary to pump this water into tank cars and haul them over the line to accomplish the task. The roadbed is sprinkled in the ordinary manner, with the train moving at a fair speed. The salt water kills the grass and weeds in a satisfactory manner.

THE PALACE OF MIRAGES

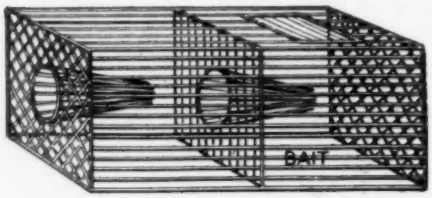
The designer of the Palace of Illusions, which was one of the novelties of Paris a few years back, has devised a new place of amusement called the Palace of Mirages. It is composed of a room of six sides and six angles, the walls of which are formed of glass. Six glass columns are also in the room. The first reflection of the glass produces six more rooms, the second 12 rooms, and the third 18 rooms. The spectator standing in the center of the real room sees 36 rooms, and outside these great direct perspectives the geometrical disposition of the six columns open to the gaze as many as 18 long avenues in all directions.

When this real room, with its many other rooms, is illuminated with the 2,500 diversely colored electric lamps provided, 1800 of which can be used at the same time, the exhibition is remarkably interesting. The illumination thus gained in the room by the three reflections is equal to that produced by 36 times 1,800, or 64,800 lamps.

CANADIAN LOBSTER TRAPS

During the closed season the Canadian fisheries in the vicinity of Nova Scotia make their own lobster traps. Each man has his own idea of what

kind of trap is best, and not infrequently a family or a community has its own particular style. In general,



Lobster Trap Used in Nova Scotia

however, the traps are of three main kinds, the one most common in use being a plain rectangular box. The frame is made of 2 by 1½-in. lumber, covered by narrow spruce lath, laid lengthwise. The average trap is 4 ft. long, 2 ft. wide, and 18 in. high. At one end of the trap is an entrance hole about 7 in. in diameter, to which is attached a funnel-shaped, woven-rope bag, open at both ends. In the middle partition is a similar opening which extends into the compartment known as the "bedroom." It is in this compartment that the bait is placed and in which the lobsters are imprisoned until taken out by the fishermen. Fastened to one of the lower corners of the trap is a line made fast to a buoy, which is usually a log about 2 ft. long, hewn to a point at one end. When this buoy is nearly out of sight the fisherman knows that the trap is full.

A CURE FOR HOT BOXES

The axle boxes on this tender are connected with a water pipe by a short hose, and when a hot box is materializing the opening of a valve allows cold water to play upon it. The device is not new, but it is quite probable that many people have passed it by without seeing or at least without knowing its purpose. The locomotive is No. 8 on the Salt Lake railway.

Hot Boxes Cooled Automatically

WOMAN PAINTS GREAT SIGN HIGH IN AIR

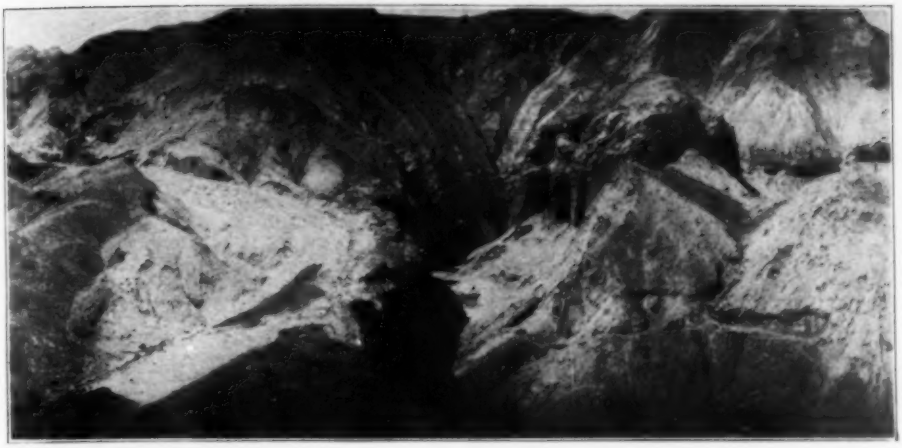
As the result of an election bet, which she lost, Miss Florence Sands, a Detroit artist, painted the advertisement of a haberdasher on a great signboard 120 ft. above the street. Straps and a couple of uprights made fast to the scaffolding afforded the young woman protection from falling. The

Courtesy Signs of the Times

Painting 120 Ft. Above Street

sign faces the busy square in the center of Detroit's business district, and thousands watched her work.

King Alphonse of Spain is interested in Maxim's invention for silencing the report of a rifle.



MOUNT BLANCO THE LARGEST BORATE DEPOSIT IN THE WORLD

By R. E. Rinehart, Prescott, Arizona

Since the discovery of borate deposits in Asia Minor, California Colemanite, or borax, has a formidable rival for the supremacy of the world's borax supply. But whether or not these European fields have as great a store of borate deposits as those yet untouched in the barren hills of Death Valley, it is doubtful if any single deposit will be found that can compare in size and quality with that contained in the formation of Mount Blanco.

With the exception of the Grand Canon, there is probably no more famous locality in the west than Death Valley, known as the "Vale below the sea," and, although there are a number of Mount Blancos in the great American desert, the Mount Blanco of Death Valley is the greatest of its name. It rises like an enormous white breast against the terra cotta ridge of Funeral Range, close to Furnace Creek Canon, a great rent that cleaves the east rampart of Death Valley. Around it is a rolling waste of bald yellow hills, none of which are mere knolls, and it towers a good 1,000 ft. above them. The low land of Death Valley, sinking for several miles westward, is probably 2,500 ft. lower.

No one ledge or series of ledges anywhere in the world contains the immense amount of borate quartz shown on the surface of this mountain of Colemanite. It is a body of ore measuring 1,000 ft. in width and 5,000 ft. in length, pitching into the mountain range at a 33-deg. angle. It is a borax quarry whose limitations cannot be even roughly conjectured, but it must exceed by thousands of tons any known borate deposit.

Death Valley is a region of whimsical contrarieties and Mount Blanco has not broken away from the nature of the place. By a capricious coincidence this largest of Colemanite deposits was the first Colemanite found, and as yet it is untouched. Previous to its discovery, American borax was all obtained from ulexite, a borate of sodium and calcium found on California and Nevada desert marshes, generally in the form known as "cotton-balls."

It was during the harvesting of borax from the Death Valley sump that Mount Blanco was discovered. Philander Lee, better known around Death Valley as "Cub" Lee, was the prospector who found borax in the mountain, and

added Colemanite to mineralogy. The discovery was made in 1881, when Lee was rambling about the hills as a retainer of W. T. Coleman, the proprietor of a borax works. Lee sold the claim to Coleman for $4,000, and thus the ore received the name of Colemanite.

Great, however, as was the supply of borax contained in Mount Blanco, it was destined to lie idle. Deposits elsewhere were found, notably a large ledge near Daggett, Cal., where it was more accessible. This took operations away from Death Valley. Present indications point to the opening of borax operations in Death Valley on an extensive scale within the near future.

WOODPECKER HOLES IN TELEGRAPH POLE

A most interesting study of the industry of woodpeckers is shown in this illustration of a section of a telegraph pole which stood beside the track of one of the great trans-continental railroads of this country. The large holes are entrances to the nests or homes of the birds, and the thousands of smaller ones were made in the search for bugs, and as convenient and safe places for the storage of such bird foodstuffs as acorns.

STEERAGE PASSENGER DEFINED

In the bill restricting the trans-Atlantic steerage traffic, which became effective on January 1, the expression "steerage passenger" is considered to mean all passengers except cabin passengers, and persons shall not be deemed cabin passengers unless the space allotted to their exclusive use is in the proportion of at least 36 clear superficial feet to each passenger.

SIGNAL FIRES OF THE AUSTRIAN FRONTIER

Every fortified position in Bosnia-Herzegovina is provided with a "rauchkugelnofen," which means literally a smoke-ball oven. This signal device has proved of great service in cases of raids made by natives on the Austrian garrisons, and would be brought into play if the threatened hostilities in the Balkans should materialize. The oven is of stone and in it is an iron grating upon which the smoke-ball rests. The ball is composed of pine wood, shavings

Signaling for Help

and other inflammable material. Before it is set on fire it is dipped in a certain solution and sprayed with saltpeter and sulphur. Each ball weighs a little over 50 lb., and burns for an hour. The dense column of smoke can be seen for miles around, both in the daytime and at night, being lit up by the glare of the fire below when it is dark. On noting the signal the nearest posts send half their garrisons to the aid of the post signaling.

DUMMY DRILL GUN ON U. S. S. "CONNECTICUT"

Naval officers report that the astonishing and record-breaking performances in the rapid firing of the big guns at target shooting during the cruise of the "Battle Fleet" around the world, was mainly due to the constant drill carried on daily with the dummy loading apparatus. The dummy drill gun here shown is on the U. S. S. "Connecticut." It is made of brass, and the breech is a facsimile of the real guns on board, having all the mechanisms, etc.

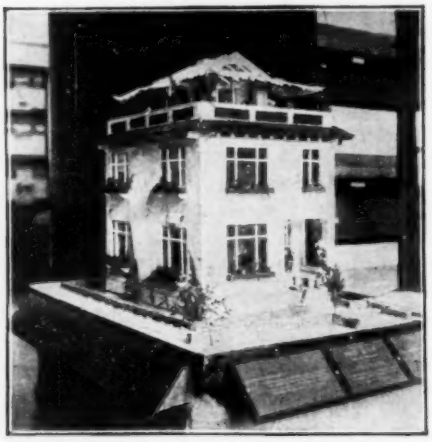
In practicing, the gunners grab up the heavy shell and the dummy charge of powder and shove them down the trough-like chamber. The closing of the breech block completes the operation. The shell and the powder bag are slid down a gravity chute at the end and are immediately used over again.

The smile on the face of the "Jackie" shoving the shell into the breech seems to signify that the gunners enjoy the practice, but it may be that it is because he is facing the camera. Facing the guns of an enemy might also bring forth a smile, but it would undoubtedly be of a sterner nature.

MODEL OF WONDERFUL CONCRETE HOUSE

The model of the new ideal sanitary concrete workingman's home, awarded the gold medal at the International Tuberculosis Congress recently held in Washington, D. C., is shown in this illustration. The entire building, with the exception of the tile decoration of the roof and the cast-iron window frames is of concrete, cast in forms. It was designed by a Washington architect, and can be built for $1,200.

The great feature of the house is the extraordinary arrangement for perfect sanitation. To clean the rooms a hose is turned on the walls and floors and the water is drained off by tiled spouts discharging on the lawn outside. There is no handling of coal or ashes, no shelter for vermin or insects, and waste heat from the cooking range warms the house. Coal is hoisted by chain block,



Sanitary Concrete House for $1,200

dumped through a coal hole in the roof, and fed automatically into the stove. Ashes drop from the firebox into a can and are then removed from the outside. Garbage is disposed of in a cast-iron chamber in the smoke flue, where waste is dried, then dumped by use of a damper into the firebox. A roof-garden furnishes outdoor sleeping apartments

A block of these houses is now being built in Washington.

TILTING A BRIDGE INTO PLACE

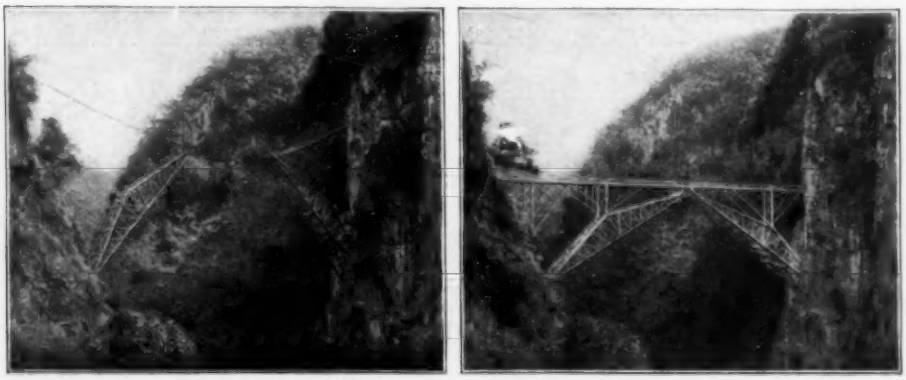
One of the greatest problems met with in building a railroad line in Yunnan, the extreme southwest province of China, was the bridging of the deep gorge here shown. On both sides the line strikes the ravine through tunnels, and the space which had to be bridged was 500 ft. wide. The task was accomplished by French engineers in a manner absolutely original as well as novel. The truss was made in two parts, one on each side of the chasm, and then these legs were tilted over until the outer ends came snugly together. The method is clearly shown in the illustrations.

WASHING AWAY PART OF SEATTLE

The work of washing away huge hills, some 75 ft. high, in the center of Seattle, Wash., described in the December issue of this magazine, is now more than half completed. The work is extraordinary in many ways, embodying many features that make it undoubtedly one of the greatest and most interesting regrading projects ever attempted in any part of the world, and the first instance in which hydraulic mining methods have been adopted for such a colossal task.

The work involves the leveling of a great hill which contains 374 city blocks, more or less built up. Hundreds of houses had to be moved out of the regrade district, schools, churches and business buildings had to be torn down or remodeled, and pavements, sewers and water mains were torn up.

Already the powerful streams of water, shown in the illustration, have



Bridging a Gorge in China

City Excavation by Hydraulic Methods

leveled more than 250 blocks of the 374, and when the great task is at last completed more than 10,000,000 cu. yd. of earth will have been sluiced away. It is estimated that the cost of the work will be close to $1,400,000.

The water forced out of the hydraulic giants not only tears the earth away, but carries it through a specially built tunnel extending from the hill to a point near the bay. This tunnel empties into an elevated flume or sluice box which runs above the railroad tracks to the marsh district along the bay. In this way the hill properties are greatly enhanced in value, at the same time making valuable lands of former marshes.

U. S. NAVY HAS MOST POWERFUL SEARCHLIGHT

The flagship "Connecticut," of the United States navy, is now equipped with the most powerful searchlight in the world. It has a strength of 180,000,000 candlepower, which, for the sake of comparison, is 179,998,000 candlepower more powerful than the ordinary street arc lamp. The great mirror is 5 ft. in diameter, and was made for the government in Germany. The searchlight will throw such an immense beam of light that it will be able to detect a submarine or torpedo boat at a distance of 10 miles. Searchlights of the same great power are to be installed on the new American "Dreadnoughts." Their cost is about $5,000 each.

With a number of such searchlights mounted on the tops of a city's skyscrapers, bombardment from aerial craft would be made rather difficult.

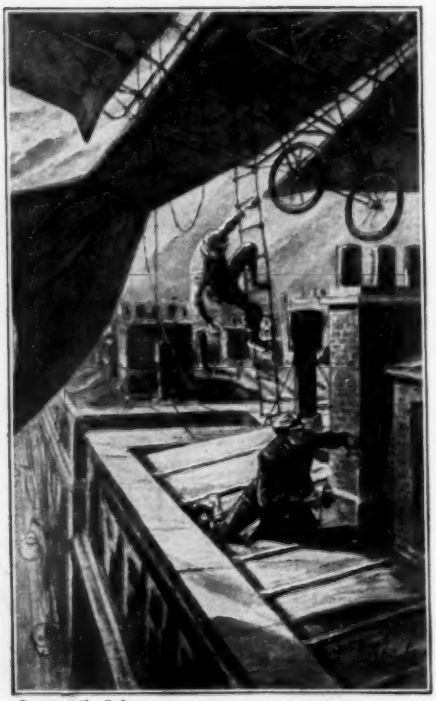
Will Throw Beam of Light 10 Miles

The illustration shows the new searchlight with a smaller one, for ordinary use, beside it.

Contracts have been let for $7,000,000 of electrical installation on Japanese railroads.

TWO POSSIBILITIES IN AERIAL FLIGHT

Aerial Rescue Work



Courtesy the Sphere

Aerial Pirates

The possibilities of aerial flight are great, but all the possibilities are not for good, as is shown by one of these imaginary drawings by one of the artists of the English illustrated weeklies. It depicts a night scene in which burglars have descended upon the roof of a house from the air to rob it of its valuables. The other imaginary drawing shows the possibility of rescuing lost mountaineers on the peaks of the Alps.

UNIQUE IDEA OF CHRISTENING A BUILDING

The unique idea of starting a building out on its career with a formal christening, as is the fashion in launching ships, is claimed to have originated with Mrs. C. E. Atkinson, the owner of a new apartment building in Chicago. Two little granddaughters, each eight years of age, took the principal part in the christening. "Good luck to this building. I name thee 'The Atkinson,'" exclaimed one of them as both dashed a bottle of champagne against the building.

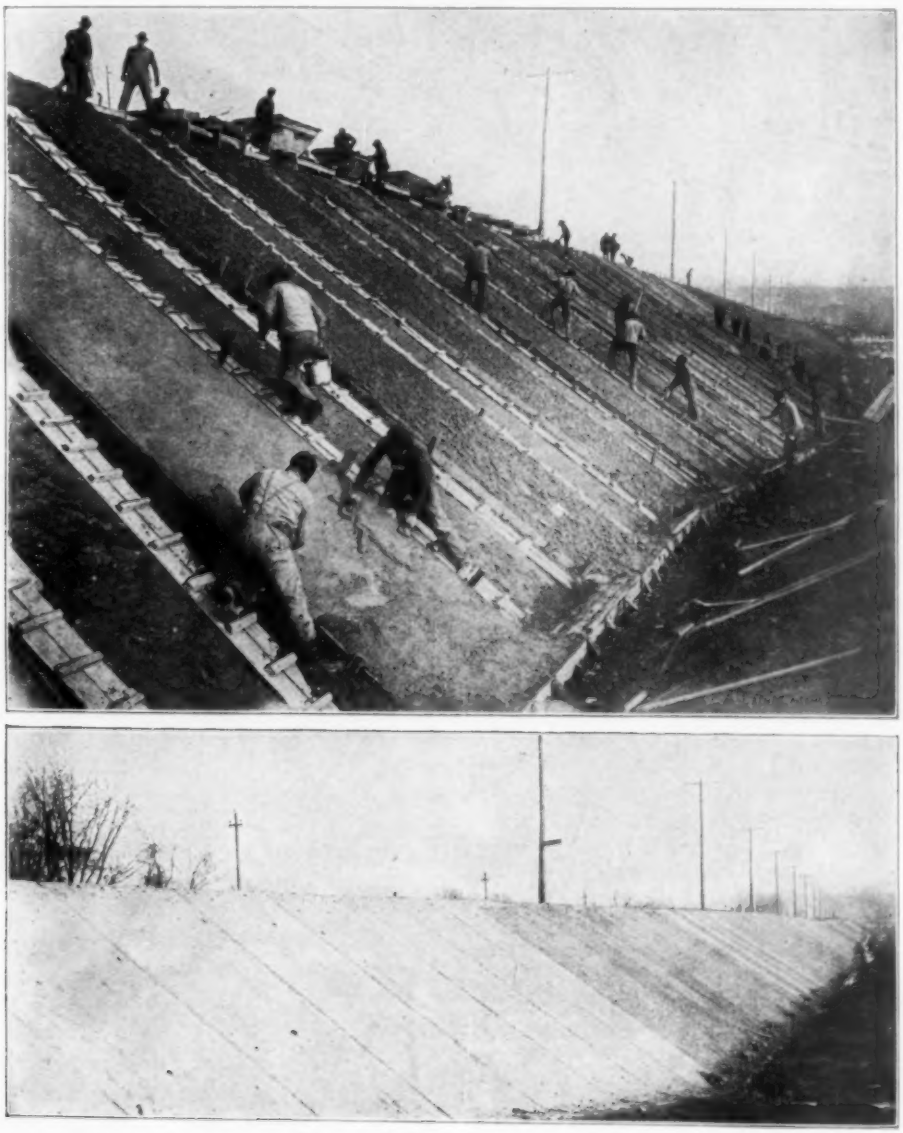
SIGNBOARDS FOR AIRSHIPS

Now that it is practically certain that dirigible airships flying above German soil will be numerous enough within the next few years to make some means of signaling necessary, Major von Frankenberg, president of the German Aero Club, advises that huge signboards shall be placed on the roofs of church towers and high buildings, with a certain code of signals, visible from airships aloft, inscribed upon them. He also suggests that the frontiers of the different European countries shall be marked by the same method, and that at night the signs shall be illuminated in such way as to make them visible. Aernonauts would carry a signal codebook, enabling them to decipher the meaning of the signals. The club is now conducting experiments to test the value of such signals.

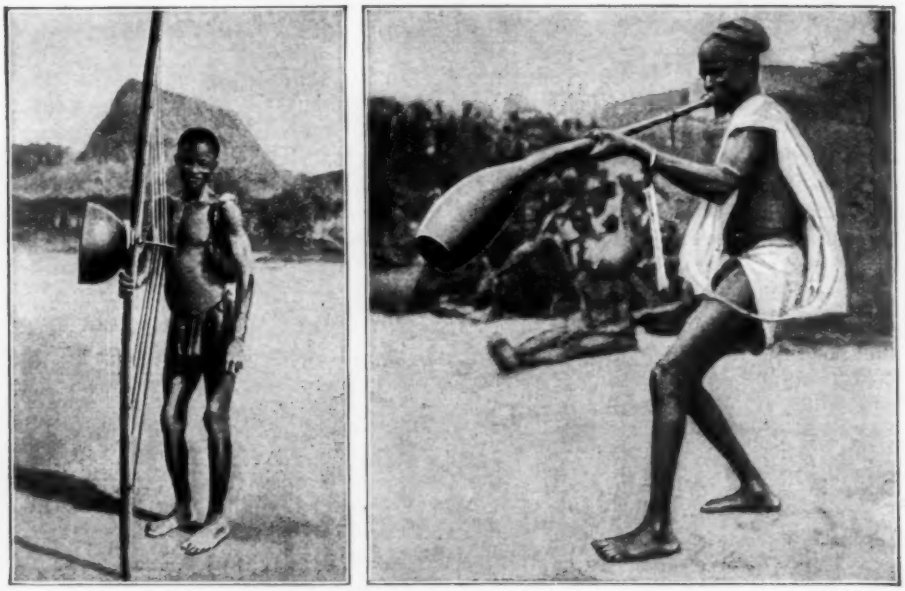
CONCRETE DYKE TO PROTECT ROAD

To prevent the Ohio river, during a flood stage, from sweeping away a road-bed and to protect farm-lands, the city of Cincinnati is spending over $100,000 in building a concrete dyking along the sides of the roadway. The big dyke will be over a mile long when completed and represents one of the largest pieces of concrete work ever done in that vicinity. The concreting slopes at an angle of 45 degrees and varies in height from 15 to 35 ft.

Illustrations show a section of the completed work and a scene at the lay-



Laying the Slope—Section of Finished Work



Musical Instruments that Torture the Civilized Ear

ing of the concrete on the sloping sides of the roadway. The concrete is laid in strips 6 ft. wide so that the men can work the surface conveniently. When one set of strips is sufficiently hard to bear the weight of the men, the intervening spaces are filled in.

INDIAN WOMEN RUN FERRY 80 YEARS

Two Indian women, known as "Sal" and "Cynthia," members of the camp at Ehrenberg, Ariz., lay claim to the distinction of being the oldest ferry proprietresses on the face of the globe. They are twins, 101 years old, and since the time of the presidency of Andrew Jackson, 1829, have eked out a daily existence pulling the oars of a flat-bottomed, home-made scow on the Colorado river. The legends of the tribe have it that the two women first established the ferry at the request of a chieftain of the Mojaves, the tribe that once ruled on the reaches of the Colorado.

A Baltimore church has a big electric "Welcome" sign over its main entrance.

AFRICAN MUSICAL INSTRUMENTS

The music made by the African tribes is a curious conglomeration of sounds, usually repellent to civilized ears, and the instruments from which the music is blown, strummed, or pounded forth, are unique. The harp shown in the illustration is one of the chief musical instruments of the Bayas, and gives sounds that are very hoarse but carry a great distance. The trumpet made of a gourd has a tone that is more ear-splitting and aggravating than the honk of an automobile horn.

LONDON REGULATIONS FOR TAXICABS

Two new police regulations concerning the operation of taxicabs have been put into effect in London. The first of these makes it compulsory to have a lamp fitted near the taximeter, so that the passenger may read the dial at night, and the second ordains that the taximeter must be driven by the front wheel of the cab. It is assumed

that the object of the latter regulation is to prevent the distance skidded by the rear wheels being registered by the meter.

THE "FLATIRON" BUILDING OF THE WEST

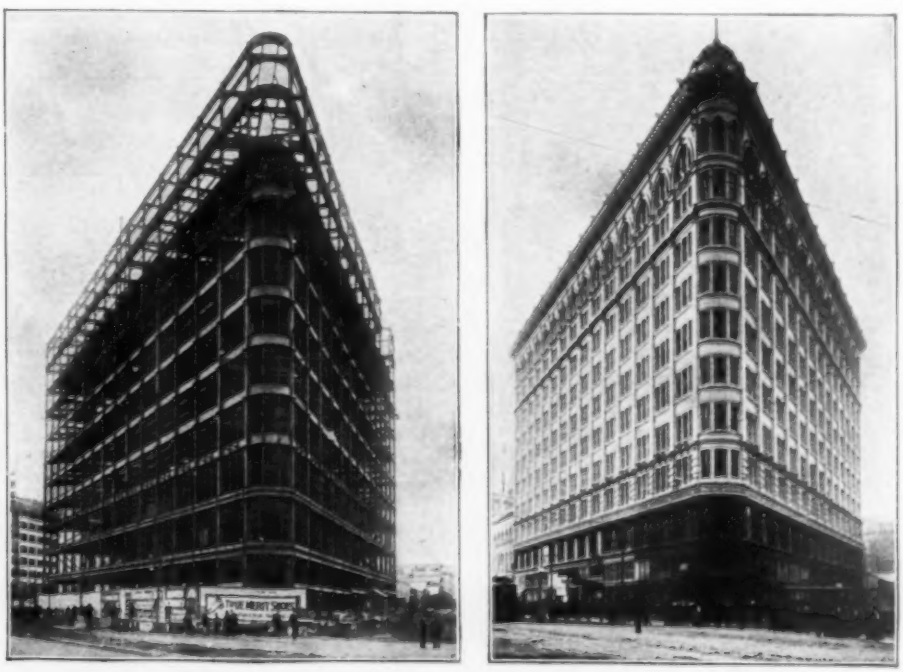
One of the greatest single features of San Francisco's rehabilitation is the new building at Market and O'Farrell streets, known as "the Flatiron Building of the Pacific Coast." The total cost of the structure, including the purchase price of the land on which it stands, was nearly $3,000,000, and it is claimed to be one of the most solidly constructed buildings in the world. In building the heavy steel skeleton more than 6,200 tons of structural steel was used, 1,300 tons of which is imbedded below the basement floor in massive piers of concrete.

According to the specifications, the building is not only fireproof, but earthquake-proof. The exterior work is terra cotta.

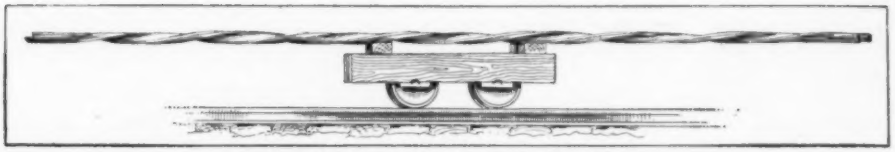
GREAT WATER PROJECT IN BRAZIL

A project now before the Brazil congress, devised to open up and improve river navigation, aims also at the agricultural irrigation of parched lands, the reclaiming of swamps, the preventing of inundations by the regulation of the water courses, and the utilization of water for power. The financial and economic aspects of the proposition are rather interesting.

A company is to be formed to carry out the work for the government, and for all services rendered to those who make use of the canals and bridges, or whose lands are benefited by the regulating of the water supply, this company will collect rates established by law. The Brazilian government will only have the right to order the execution of works where they are sure to prove remunerative, or, in other words, where the influence of such work upon local agriculture will be such as to enable the owners of the land to pay the



San Francisco's "Flatiron" Building in Course of Construction and Completed



Rolled Manganese Steel Rail Twisted Cold

rates. The company will undoubtedly acquire large tracts of land in the territory to be benefited, and the resale of these lands after the improvements are made will be a great item of profit to the company.

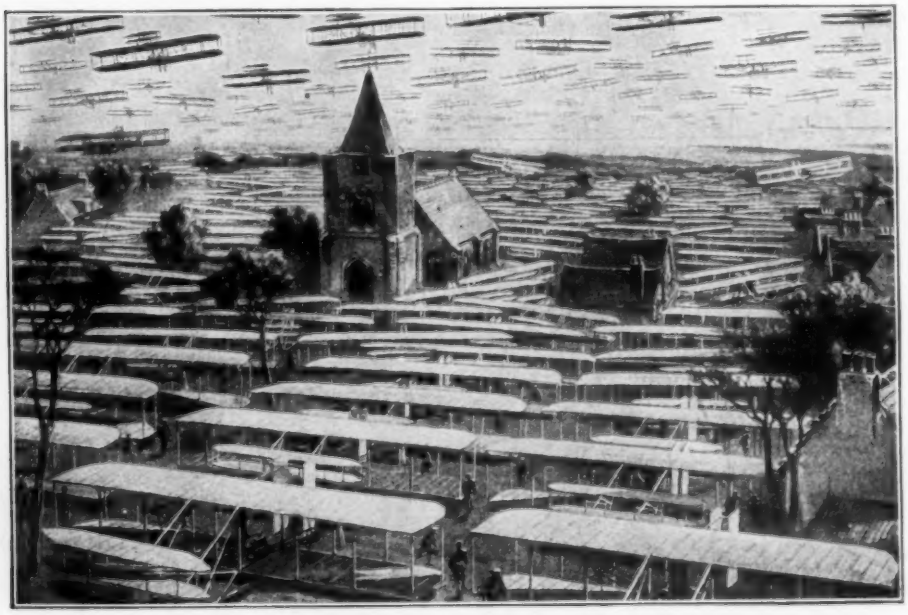
STEEL RAILS THAT CAN BE TWISTED

A steel company in Hillburn, N. Y., rolls a manganese steel rail that can be bent, twisted, and distorted cold without breaking or developing cracks. It has a high elastic limit with an ultimate strength of about 140,000 lb., and is so hard and tough that its life is claimed to be extraordinary. The manganese steel rail cannot be drilled or machined commercially, yet the rail can be cut to any length by a friction saw and holes punched and drifted accurately for joint bolts and bonding.

AEROPLANES TO TAKE PLACE OF CAVALRY

The flying-machine, according to Wilbur Wright in an interview with the representative of an English magazine, is in the main a military proposition. Pleasure or sport as an incentive will abound to a certain extent, but only in a limited degree, and commercialism, other than in the manufacture and sale of flying-machines, will be still more limited.

"The future I see for the flying-machine," said Wright, "is with armies. Every army will have not one, but hundreds of them, carrying three or four men and ammunition, and capable of keeping the enemy continually

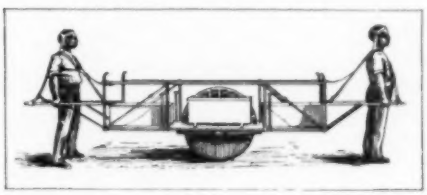


"Every Army Will Have Hundreds of Them"

harassed. Naturally, these machines will take the place of cavalry, and will be very much more effective than that branch of military service now is." The London Illustrated News portrays its conception of Wright's prediction in the illustration of such a fleet.

THE DOUBLE-END WHEELBARROW OF AFRICA

This curious vehicle is used in the French colonies of Africa for transportation, often carrying the supplies of parties on long distance trips. The one large wheel in the center has a wide wooden rim, covered with leather. The body, the framework of which is

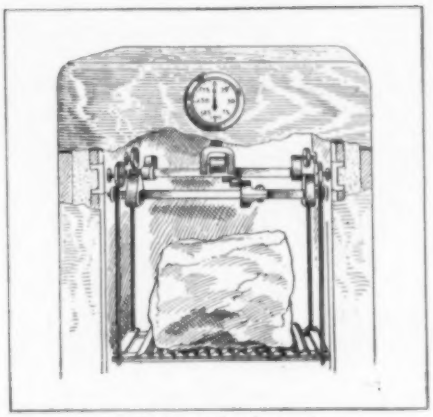


Curious African Vehicle

composed of bicycle tubes, rests upon springs. The man in the forward shaft pulls and the one in the rear shaft pushes. The man-power is applied, and the equilibrium of the vehicle is maintained, more by the leather harness in which the two men work than by their hands on the shafts. This harness is not only fitted over their shoulders, but over their heads as well. The one wheel makes the vehicle run much easier over the rough roads and trails than would be the case if there were two or more wheels. The framework is easily taken apart if desired.

WEIGHING ATTACHMENT IN REFRIGERATOR

By the attachment shown in this illustration the possibility of the iceman short weighing in the amount of ice he places in the refrigerator is impossible. The ice rack is the platform of the scale and the dial registers the amount of ice at all times. The rack



A Tab on the Iceman

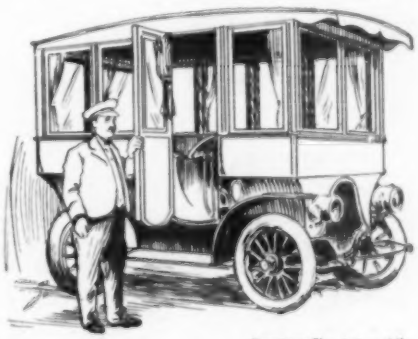
can also be used for weighing other articles under 200 lb. by removing the ice.

SHOSHONE BRIDGE TO BE 550 FT. HIGH

One of the highest bridges in the world is about to be constructed across the Snake River cañon, a few hundred feet from the great Shoshone Falls in Idaho. The span of the bridge will stretch for 1,140 ft. from cliff to cliff, at a height of 550 ft. above the surface of the water, and afford a grand view of the falls.

AN AUTOMOBILE HOUSE

The body of this automobile was built by a Florida man, who wished a machine in which he could live as well as ride around the country. Not only is



Courtesy The Automobile

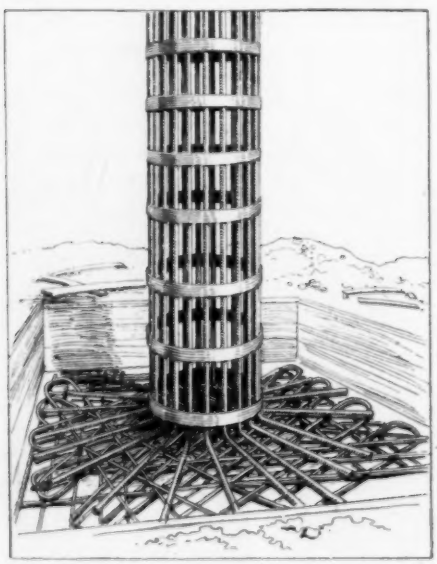
Combination Touring Car, House, and Business Office

it used to ride in and live in, but also as a place of business, being so arranged that it may in less than a minute be converted into a working, a sleeping, a dining, or a library car. It has an interior of mahogany, plate glass windows, silk curtains, electric lights, and other modern conveniences.

The body of the car was built by the owner himself. Working on it one-half of each day it took 15 months to build, and cost $3,700. Despite its fittings the car weighs but 2,300 lb. and is very fast.

CONCRETE WORK IN A TEMPERATURE OF 24 BELOW ZERO

The massive reinforcement which is often used in concrete columns is excellently shown in this illustration of a concrete building in St. Paul, Minn. It is interesting to note that the work shown was executed during the cold weather, a large part of the heavy retaining walls having been put in at temperatures ranging from 22 to 24 degrees below zero. Heat was supplied from the boiler plant of the company, and the materials, both sand and stone, were heated before mixing the concrete.



Courtesy Concrete

Concrete Column Reinforcement

GERMAN INVENTION COMBINES PHONOGRAPH AND SIREN

Its Words Can Be Heard Miles Away—May Have Future as Musical Instrument

By Thomas H. Norton, U. S. Consul at Chemnitz

The methods for recording sound have reached a higher stage of perfection than those employed for its production, the chief difficulty encountered in the present systems of reproducing conversation, and especially music, from records being caused by the friction of the needle. The needle produces a more or less noticeable buzzing or rumbling sound, which interferes materially. A German inventor has patented an instrument, however, in which friction is completely avoided. It combines the leading elements of the phonograph and the siren, its chief feature being the substitution of a current of compressed air for the needle now commonly used.

Openings of various sizes in a siren allow the production of all musical notes with any desired degree of intensity or length. In the new instrument, perforations in the disk of a siren are replaced by incisions on the surface of a large record cylinder. A second perfectly smooth cylinder rests close upon the surface of the first cylinder and revolves in unison with it. A constantly varying succession of minute openings between their surfaces is presented, due to the incisions on the record cylinder, and when a powerful blast of compressed air is directed upon the line of contact between the two cylinders, at such an angle as to be an exact tangent to the surfaces of both, sounds are evoked identically the same as in the case of an ordinary siren. It is thus possible to communicate signals and even words which can be heard miles away.

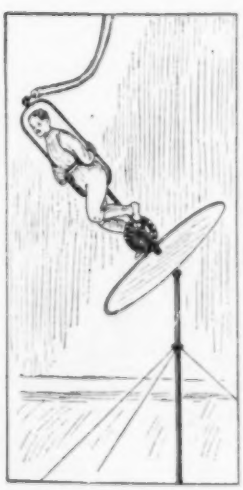
It is already evident that a field of usefulness is open to this new invention as an adjunct to the equipment of sea-going vessels, but its availability, on a smaller scale, for musical purposes

has not yet been tested sufficiently to determine whether it can successfully vie with the ordinary phonograph. The cylinders thus far employed are about ten times as large as an ordinary phonograph record, and this fact renders the instrument somewhat clumsy in its present design. The requirement of a current of compressed air may also stand in the way of its widespread domestic use, although such a current can be supplied by a comparatively inexpensive attachment to a water tap where the water supply is under considerable pressure.

PETROLEUM PRODUCTION IN 1908

The production of petroleum in the United States in 1908, according to the geological survey, amounted to nearly 180,000,000 bbl., an increase of nearly 9 per cent over the 166,000,000 bbl. produced in 1907. The total value of the product showed an even greater proportionate gain, for the price of oil increased in California and remained steady in other fields except the Gulf. The increases are attributed to steady growth in production in Illinois and California.

A HUMAN GYROSCOPE



One of the most thrilling acts now being staged is called the "Human Gyroscope," the performer causing the top, of which he is part, to spin by pedalling. The rope at the top of the frame in which he braces himself sustains the weight only at the start and at the finish, hanging loose most of the time while he is whirling around on the top of the rod.

THE "AMERICAN SPECIAL" IN ENGLAND

One of the most luxurious trains in England is the new "American Special," which carries the passengers of the Trans-Atlantic liners from the west

English "American Special"

coast of England to London. The interior views show the fittings of the English cars that correspond to the "Pullman" cars in America.

A Russian anarchist recently planned a means of attempting to assassinate the czar from an aeroplane.

Wilbur Wright may establish a permanent aeroplane station on the French Riviera.

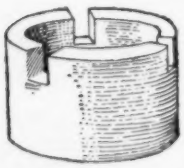
YACHT THAT SAILS ITSELF

No Electricity, Steam, Springs, Gas or Other Engine—This Mechanical Curiosity Sails, Steers, Tacks, Trims Sails and Returns to Landing with No Skipper But the Wind

By Herbert Consterdine

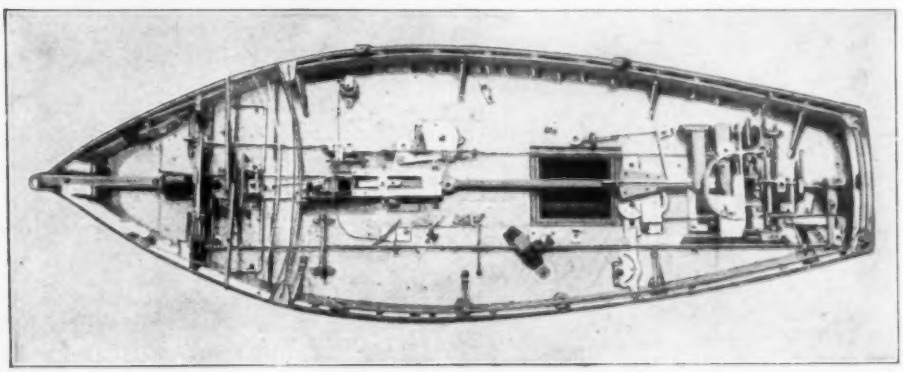
First of all, it would be well to understand that all the automatic actions are for and during actual sailing; that is, when she is moving through the water; she does not hoist and lower her sails on land or in dock.

While sailing, there is a small screw or "ship's log," trailing aft, attached by suitable flexible cord about 18 in. long to a small shaft on deck, which projects about 1 in. beyond the stern, so while vessel is sailing the screw is revolving and gives motion to the central shaft. On the forward end of this shaft is a worm, geared with a large worm wheel. This worm wheel lies horizontally—its shaft is upright; on top side of the worm wheel is what I call a turret (see cut) revolving slowly with the worm wheel.



The inner or swinging end of tiller passes immediately over this turret and only just clears it. A metal peg sticking downwards from under side of tiller engages in the inside of turret. The main "sheet" (or cord) from main boom is attached to the tiller instead of to bits on deck; consequently, there is always a good pull on tiller to leeward, which of course changes from starboard side to port side alternately as vessel is tacking to windward. As this turret is revolving slowly, the peg under the tiller will escape or pass through one of the three openings in the side of the turret because of the pull of mainsail sheet; and helm will be pulled over as far as the arrangements permit. This of course takes place at the end of the tack. Besides putting the helm hard down to turn the vessel around on to the other tack, a motion is carried to forward end of the deck by means of the central connecting rod, one end of which works on a pin on the top side of the tiller, and so pulls the connecting rod aft when the tiller moves either to starboard (right) or port (left), and pushes the connecting rod forward when the tiller comes back into central position. Of course the tiller cannot get past the central position until the turret has revolved a considerable distance (one-sixth of a revolution), and thus escapes out of the opening on the other side; and so on alternately as she completes her starboard and port tacks.

On the deck, well forward of the



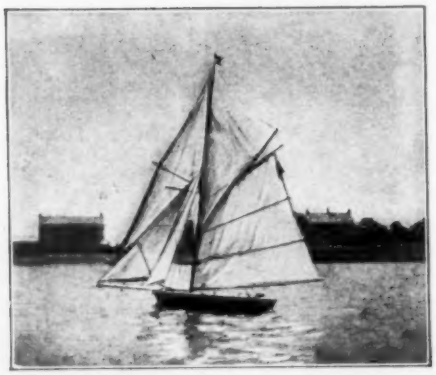
Deck View Showing Mechanism for Working Sails and Rudder

hatch, are two brass slides. If the tiller moves to the right the connecting rod engages with the right brass slide; if the tiller moves to the left it engages with the left brass slide. The movements of these slides work the foresail and jib sheets. When the helm is moved to starboard at end of port tack, or to port, at end of starboard tack, the forward sail sheets are released or slacked away to flap in the wind; consequently these forward sails being slacked away in conjunction with the helm or rudder at the stern (both working for the same object), the vessel is bound to answer and swerve around on to the next tack. Besides the slacking away of the forward sails; to assist in bringing her head around, the foresail is held out at an angle for the wind to strike it in this position, until its object is accomplished, that of bringing the head around. When this is done, the wind blows on the other side of the vessel to what it did before—these actions worked the change—so now the wind will blow the mainsail right over the deck as far as the main sheet will permit, and this rope being attached to the tiller will bring tiller back into central position into the turret through the same opening it escaped through two or three seconds before. At the same time, the mechanism operating the forward sails, being worked from tiller through the connecting rod, releases their temporary holdings and allows the sails to take their respective positions (to leeward) on new tack.

The turret can be moved slightly forward or aft to alter the proportion of length of one tack to the other, viz., by moving an eccentrically slotted segment (shown in deck photo, 1¼ in. from stern and at extreme left). The wheels near this slotted segment and in centre of deck are for reducing the speed of revolution between the log screw and turret wheel.

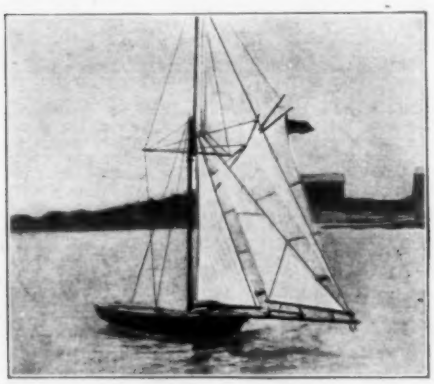
The wheel for controlling the number of tacks made against the wind, before returning home again running before the wind, is a register wheel, shown on the cut 2½ in. from stern, just above after end of the brass slides. One tooth is taken on this wheel for every two tacks completed; the catch is worked by a motion transmitted from tiller and connecting rod; catch is shown immediately beside the wheel, between it and the brass sliding pieces. It is loose-

1—Nicely under sail. 2—End of starboard tack; helm is put down; forward sails are slacked away in order to bring her head up into the wind, or "luff." 3—End of port tack; helm is put down and forward sails are slacked away to change tack.



The foresail is held out at an angle to catch the wind and pull head of boat over onto port tack; then foresail is released and all sails and helm take their proper positions and another tack is commenced.

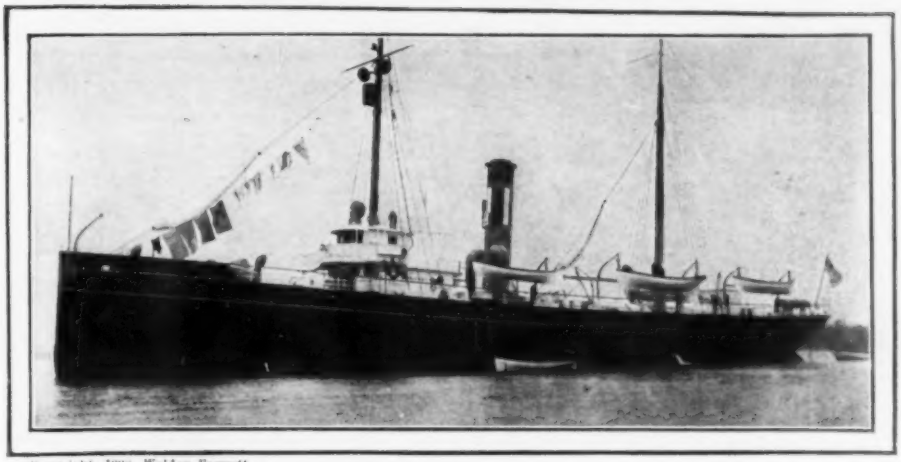
ly attached to a lever worked from forward end of connecting rod; this lever is shown at a slight angle near to the brass slides and register wheel. A peg is fixed in this register wheel on the upper side, which gradually works around until it comes in contact with a projection on a sliding rod extending from forward mechanism to rudder mechanism aft; when this long rod is moved forward by the register wheel peg, it releases mainsail sheet so the mainsail will blow out nearly square with the yacht for running home before the wind. It also releases a pair of holders for holding foresail exactly amidship fore and aft. This foresail held in this position is now the controlling power for *steering* the yacht *dead before* the wind; thus if the wind is playing about on both sides of foresail, that is all right, the yacht is dead on her course to leeward. If the action of wind on mainsail standing out to port side, causes yacht to turn slightly to her right, the right side of foresail will then get the wind, and the sail will press to the left side and move the sail holders slightly to the left. This motion is conveyed aft by a rocking shaft to the first or primary motion shaft, being turned by the little screw-log in the water trailing after the yacht. By means of a pair of gear wheels, a small one on primary motion shaft and a larger one on a barrel shaft, the barrel is caused to turn, and by means of a cord around the barrel or drum, the tiller is pulled to steer, and counteract the action of the wind pressing against mainsail. As soon as the yacht is thus put again *dead* before the wind, the wind ceases to press against right side of foresail, so now the pressure (keeping the steering wheels in gear) no longer is effective, and the wheels are disengaged and the helm is eased back to normal, and thus this beautiful and harmonious action continues until the home shore is gained.



Coming Home—Running Before the Wind

It will be readily seen that the ability of this yacht to beat to windward is practically unlimited; so long as there is wind she will move through the water, her log will turn and revolve the turret, the same wind will press the sails, and tack after tack will continue until the weather shore is made, no matter how many tacks are required to do it. Of course if an abnormal number of tacks are anticipated it would be advisable to disengage the catch operating the register wheel, because if this is not done she will only accomplish the number of tacks in accordance with the "distance back" the register wheel peg is set at commencement of cruise.

This yacht, the "Nydia," is not large enough to carry a man, being only about 5 ft. long on deck and 9 ft. long over all spars, but I see no reason why the same construction will not work fully as well in a larger boat.



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UNCLE SAM'S DERELICT DESTROYER

A Remarkable Cruiser Just Added to the U. S. Fleet of Vessels—Its Mission Is to Succor Imperiled Navigators, to Repair Disabled Ships, and to Destroy Abandoned Wrecks

A ship extraordinary has just been added to the United States government fleet of vessels in the derelict destroyer "Seneca," and not only is she a novelty among American ocean-going craft, but the only vessel of the kind ever designed or constructed by any country. The main reason for the "Seneca" is, of course, indicated by her title of "derelict destroyer," but the usefulness of the powerful vessel is by no means to be confined to the removal of derelicts, wrecks, or other menaces to navigation.

Quite as important to maritime interests is her role as a missionary of relief at sea. The need of such a vessel has been keenly felt for years, the more so because, with the increase of the commerce of the world, there has been a proportionate increase in the number of derelicts sighted each year. A derelict is a

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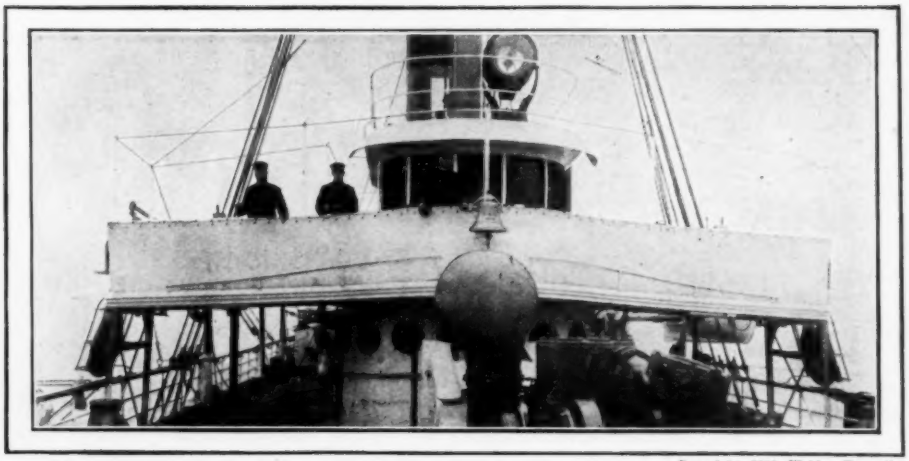
Fire Drill on Board the "Seneca"



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Wrecking Machinery and the Bridge of the Ship

submerged hulk that floats hither and thither with the ocean tides, constituting the most serious menace to modern navigation and the one most difficult to avoid.

The new ship, which is already spoken of as "The Good Angel of the High Seas," is under the jurisdiction of the U. S. Revenue Cutter Service, and it is appropriate that she is in this maritime department of the government. During recent years the revenue service has devoted a steadily increasing amount of attention to the destruction of derelicts and relief work of all kinds at sea.

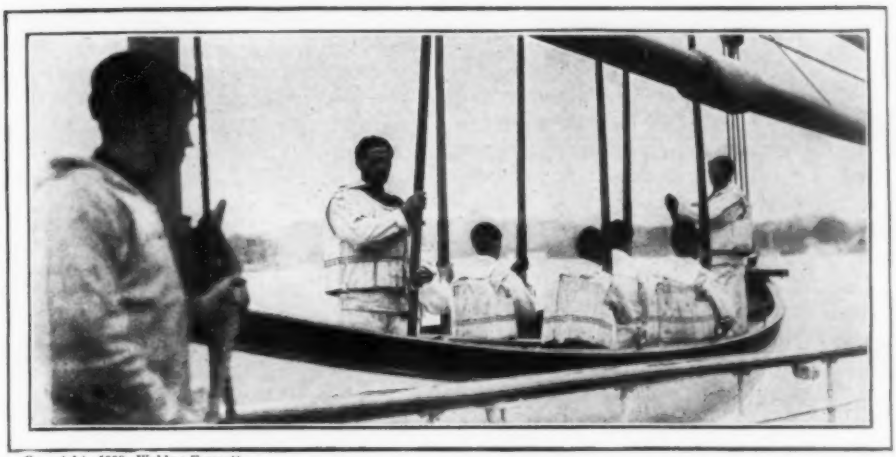
The "Seneca" cost $250,000, and is well equipped for the service she is to render. Her steaming radius is exceptional, a most important consideration in derelict hunting, and she will carry enough coal at all times to enable her to steam across the ocean in her chase after derelicts. She is a spar-deck vessel, 204 ft. over all in length, 34 ft. beam, and is schooner-rigged with two pole masts without gaffs.

In appearance she is thoroughly distinctive, it being important that she be readily recognized at a distance. The hull is a dark green, with upper and lower shear mouldings light in color from stem to stern. The upper works and lifeboats are white, and the spars and smokestack yellow, the latter having a black band at the top, and red, white and blue vertical stripes running to the lower guy band. To make her still more easily distinguishable, the foremast carries a signal yard, from which is displayed a black spherical shape about 3 ft. in diameter. These can be seen in the illustration, which shows a full view

Heaving the Lead on the "Seneca"

Copyright, 1908 Waldon Fawcett

Wireless Telegraph Station



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Life-Savers Ready for Rescue Work

of the vessel. At night she displays a distinguishing signal in the form of two truck lights, red on the foremast and white on the mainmast, with simultaneous 15-second flashes. Finally, a wireless telegraph outfit enables communication with all ships similarly equipped, and with shore stations.

The equipment the "Seneca" carries was never before found on any one vessel. Foremost among these accessories is a varied assortment of explosives for the destruction of derelicts. The magazine in her hold can accommodate sufficient dynamite to blow up a fleet of ships.

Complete as are the facilities of the ship for destructive purposes, they are excelled by her means of aiding disabled vessels. There is a machine shop manned by men of experience in making quick repair work, a powerful derrick and other appliances which make her the equal of any wrecking tug, diving apparatus for making under-water repairs, and a full complement of steel and manila cables for towing purposes. A hospital, thoroughly modern in equipment and in charge of a skilled surgeon, cares for the shipwrecked and injured.

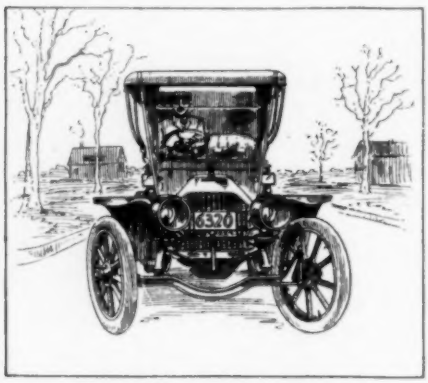
The "Seneca" is also a floating life-saving station, as well as a destroyer of derelicts and a repairer of ships. She has line-carrying guns, breeches buoys, life and surf boats, and, in short, all the utensils of a modern life-saving corps. Her boat crews are trained to handle heavy-sea working boats under all the conditions likely to be encountered. Moreover, the "Seneca" will at all times carry an extra supply of provisions for suffering mariners, and has surplus quarters where rescued persons may be accommodated until they can be landed at some convenient port.

The new ship is as powerful as she is staunch, a highly essential detail, as she must be capable of steaming 5,000 miles if need be, without once stopping to replenish fuel or other supplies. Her 1,800-hp., triple expansion engines may, at any time, be called upon to put forth the extra force necessary to drag a ship much larger than herself through long leagues of unruly seas, and energy must also be furnished to operate extra powerful wrecking and fire pumps. Incidentally it may be noted that the crew is as thoroughly drilled for fighting a fire on other ships as a fire of her own, and a fire on a ship at sea will be robbed of its menace once the "Seneca" has steamed alongside in response to an alarm sounded by wireless telegraph.

The Atlantic ocean is a large expanse of water to be patroled by one ship of this type, but the government expects the "Seneca" to make her name famous.

AUTO LAMPS THAT TURN WITH THE FORWARD CARRIAGE

A device which makes possible the turning of automobile lamps with the steering apparatus, so that the track taken by an automobile in running around curves will be as well illuminated as a straight stretch of road, has been patented by an Ohio inventor.



Lamps That Light the Curves

With automobile lamps stationarily attached to the frame of the machine, as is now customary, the illuminated stretch, when going around a curve or a circular track is away off in the fields or on the side of some one's house instead of on the path the machine is taking.

The apparatus is attached to the steering wheel, so that the turning of this wheel not only swings the forward wheels but the lamps as well.

ACQUIRING OYSTER FARMS IN TEXAS

To become an oyster farmer on the coast line of Texas it is first necessary to assure the United States government that you are a resident of the state. After this formality the government gives the person wishing to locate a farm the riparian right to locate as many as 50 acres of land, covered by water. He must pay a surveying fee of $10 and a rental of 10 cents per acre for the first five years, after which his yearly rental is 25 cents per acre. So long as his rent is promptly paid he is amply protected, and he is also permitted to gather seed oysters from certain reefs for planting.

After locating and marking the boundaries of his farm with stakes, in order to avoid disputes with other planters, the oyster farmer prepares for planting. All debris and snags are cleared away, mounds are leveled and hollows filled. If it is necessary to build stockades to protect the oysters from fish this step is next in order, and then the bottom is strewn with oyster and clam shells, or gravel and sand, thus serving the double purpose of preventing the oysters from sinking into the soft soil of the bottom and of offering a place of attachment for the spat.

The cost of transportation of oysters is less than 15 cents per barrel, and as the market price of good oysters is from 75 cents to $1.25 per barrel, a good margin is left for the expense of gathering and marketing. Owing to the mildness of the climate and the long growing season in Texas, the oyster is specially prolific there. Of the 40 bays, lakes and coves along the coast of Texas, there are few, if any, without a natural oyster bed, so there is no lack of seed oysters within easy reach of good grounds.

BOTTLE PUZZLE FURNISHED BY NATURE

Many ingenious bottle puzzles, devised by men, baffle the brain in the attempt to discover how the contents were inserted, unless accomplished when the bottle was blown, but this puzzle is one of nature's own making. The tree is a locust growing in Rockford, Ill, and it is presumed that the large, green bot-

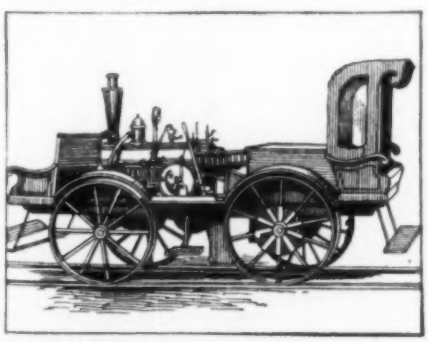
tle-neck was lying on the soil from which the tree sprouted and was carried upward as the tree grew.

FIRE-FIGHTING THROUGH LONG LINE OF HOSE

As far as has been ascertained by a firemen's magazine the longest line of hose ever used to fight a fire had a length of 3,200 ft. The fire was near the center of a 1,900-ft. railroad tunnel about 20 miles distant from Knoxville, Tenn. The Knoxville fire department responded to the request for aid and a fire engine was shipped to the scene of the trouble. The engine drew water from a pond some distance from the tunnel, and for two days and nights drove it through the 3,200 ft. of hose.

OLD AUSTRIAN INSPECTION ENGINE

The curious inspection engine shown in this illustration was built in 1876, not quite so long ago as the appearance of the engine would lead readers to believe, for a railroad line in Austria. The driving shaft had two heavy flywheels connected by belts with two pulleys on the axle of the rear pair of wheels. By means of this gearing a speed of 20 miles an hour could be maintained on a level roadbed. Seats



Courtesy of Locomotive, London

Inspection Engine, 1876

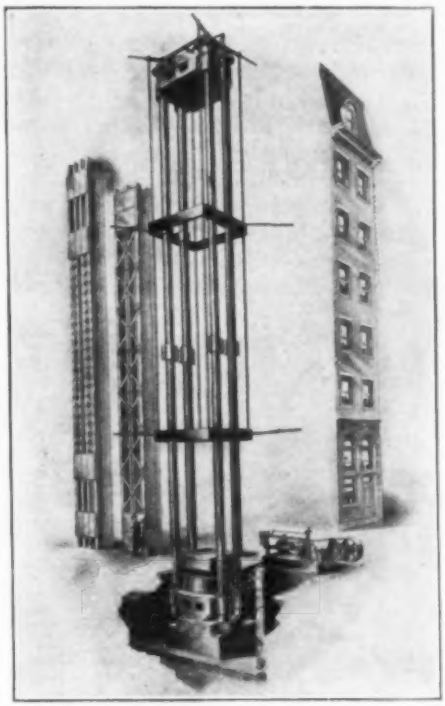
in front and in the rear accommodated the inspection officers, the rear seat having a quite ornate wind screen.

TEN-MILLION-POUND HYDRAULIC COMPRESSION TESTING MACHINE

Constructed by U. S. Geological Survey for Testing Built-Up Structures — Largest in the World

By R. L. Humphrey, Engineer in Charge

A vertical hydraulic compression testing machine of 10,000,000-lb. capacity,



Machine for Testing Built-Up Structures

the largest in the world, is being constructed for the structural materials testing laboratories of the United States Geological Survey. The machine has a gross weight of over 200 tons, and an extreme height above its foundation of about 80 ft. A better idea of its huge size may be obtained from the accompanying illustration in which is shown one of the chords of the Quebec bridge which collapsed, a still larger chord used in the Blackwell's Island bridge, and an 8-story building, the latter being shown for comparison only. It is readily apparent that the machine is

capable of testing built-up structures of even greater size than the bridge chords.

The machine or hydraulic press consists of a base containing the main cylinder, with a sectional area of 2,000 sq. in., upon which rests the lower platform or head, provided with a ball and socket bearing. The upper head is adjustable over four vertical screws, 13½ in. in diameter and 72 ft. long, by means of gearing operating the four nuts, with ball bearings, upon which the head rests. The shafting operating this mechanism is connected with a 15-hp. motor which operates the triple plunger pump which supplies the pressure to the main cylinder. Connected with the press is a weighing device consisting of a set of standard levers upon which is weighed 1/80 of the total load on the main cylinder. The weighing beam is balanced by an automatically operated poise weight and is provided with a device for applying successive counterweights of 1,000,000 lb. each.

The great weight of the principle parts of the machine is interesting. The castings for the base and top head weigh approximately 50,000 lb. each, and each main screw weighs over 40,000 lb. The lower platform weighs about 25,000 lb., and the main cylinder about 16,000 lb.

The machine was primarily decided upon for the purpose of studying the effects of flaws and defects in large blocks of natural stone, but in order to compile data relative to the strength of structural columns of brick, concrete, and structural steel, the original clearance between heads was increased from 25 to 65 ft.

ROOT GROWTH IN A SEWER

The illustrations show a root taken from a 6-in. sewer in Greenfield, Mass. The main root is only ½ in. in diameter, but from it more than a thousand small roots, about the size of coarse thread, branch out. The illustrations give an excellent idea of the resultant tangle by which the sewer was clogged.

Roots Often Stop Up Sewers

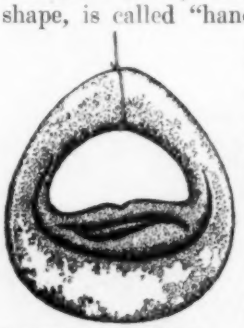
Such growths are the cause of many instances of sewer trouble.—Contributed by Lloyd Morgan.

A FEW GAS STATISTICS

According to the reports of the geological survey, 58,000,000,000 cu. ft. of coal gas was made in the United States during 1907 by 513 companies. Of this product 54,600,000,000 cu. ft. was sold for $36,327,897, and the remaining 3,400,000,000 cu. ft. was "lost, strayed, or stolen." The average value of the 1907 product was 66 cents per 1,000 ft. The product of 1906 averaged 81.4 cents per 1,000 ft., which shows that gas is becoming cheaper.

LOAF OF RUSSIAN BREAD

Russian bread, owing to its peculiar shape, is called "handle bread." The shape is due to the liking among the Russians for crust, and the protruding lip between the handle and the body of the loaf is simply a means of increasing the amount of crust surface in each loaf. The bread is made of durum wheat flour, better known in the United States as macaroni flour.

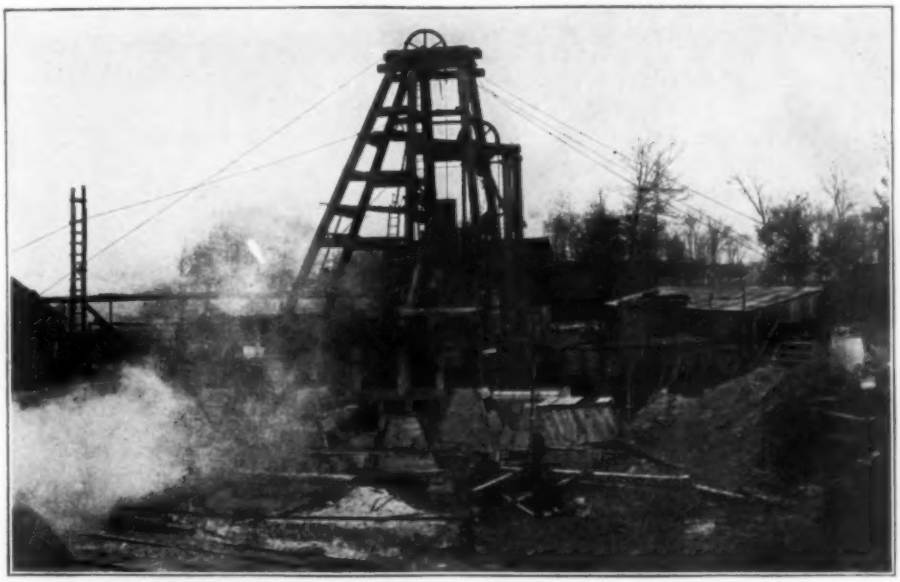


Courtesy Northwestern Miller

TEN YEARS' STRUGGLE TO REACH ROCK SALT

Remarkable Persistence Shown in Attempt to Sink Shaft to Deposit of Rock Salt, and End is Not Yet—Problem After Problem Has Had to Be Solved and Lives Have Been Lost, but Work Continues

From the sinking of the first test well 10 years ago to the present time a constant fight against heavy odds has been made in an attempt to sink a shaft to vast deposits of rock salt which lie 900 ft. beneath the ground near Detroit. No sooner was one problem disposed of than another presented itself.



Top of Shaft Where Many Lives Have Been Lost

At every turn difficulties undreamed of appeared, driving the workers away like chaff before a wind.

Mining rock salt is a different proposition from procuring the common or table variety. With the latter the deposits are pierced, water is pumped in, and brine thus formed pumped out, and the salt regained by evaporation. Rock salt is mined much the same as coal, necessitating the sinking of a shaft large enough to permit the easy access of workmen and the handling of the product.

It was first necessary to sink a test well adjoining the location of the proposed shaft. Everything progressed favorably until the 6-in. bit struck sulphur water about 200 ft. down. This was not considered bad, but when another flow was struck 40 ft. further which filled the hole and shot 500 gal. per minute out of the top, the contractor withdrew from the proposition. But the promoters refused to abandon the task, and weeks were devoted to a study of how to shut off the water. A barrel of exceptional strength was procured and filled with limestone particles secured from the sulphurous flood. Pipes were inserted and the conditions at the bottom of the test well were duplicated as closely as possible. Then, by means of a strong pump, a thin solution of cement was forced into the barrel, combating the flood of water that flowed through it. This was the test on which all depended, and it was successful. A few hours after the cement was forced into the flood of water

There are a number of large estates or residence parks owned by millionaires in America, but few of them are large enough to warrant the building of a miniature railroad to carry guests from one part to another, even though not taking into consideration the fact that the automobile offers a more satisfactory and economical means. This little train runs on the great estate of a member of the English nobility, and is probably considered more as a fad by the owner than a practical means of carrying guests to the show places of his estate. It will carry eight people at a speed of 15 miles an hour.

the barrel was knocked to pieces, and instead of the loose limestone it was found to contain a mass of concrete firmly set.

Hardly had the actual sinking of the shaft been started when quicksand and silt were encountered in quantities. One day there came a warning crack from the bottom of the shaft, and the great timbers, seemingly capable of withstanding any strain, were split into kindling, and the shaft buckled and closed up from the bottom. Where a few moments before had stood a solidly constructed shaft was a mass of broken timbers and dirt that ruined months of hard labor.

Again the contractors refused to continue, and another contracting company was organized. A bell-shaped shield with a knife extending some distance below the timber frames was employed, and inside this shield, which because of its peculiar shape and great weight lowered itself as rapidly as the dirt was taken from beneath, the workers toiled.

Limestone was at last struck, but this presented more difficulties. There was constant danger of striking a flood of water that would fill the shaft, but by means of an ingenious drilling device it was possible to keep watch of developments 25 ft. or more below the bottom of the shaft and guard against danger from this source. Immediately water was struck the valves at the top of the drilling device were closed. Down at the 150-ft. level a stream was encountered that spurted high into the air. Several holes were drilled in a circle about the outer edge of the shaft, running well down past the source of trouble, and extending outward. These were filled with a solution of cement, which was permitted to harden. When this was accomplished it was found that the cement, mixing with the limestone, formed a solid wall, as the barrel test had indicated, effectually cutting off the water.

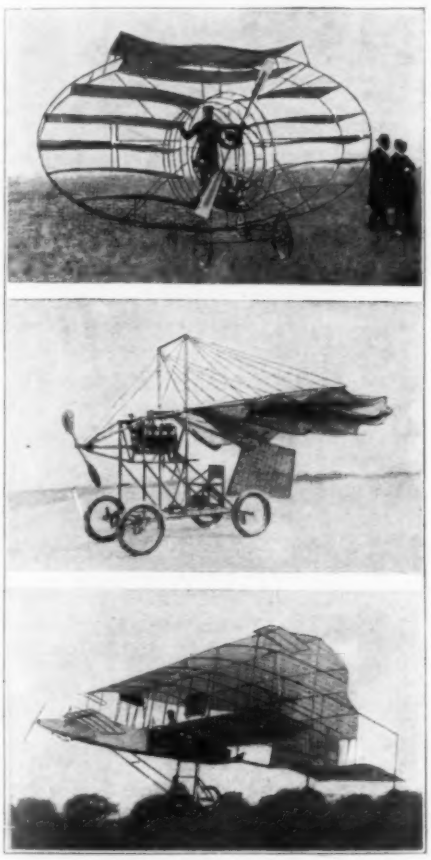
Two hundred feet underground, however, a flow of water was struck that could not be so easily controlled, and closely following the workers as they escaped, the water filled the shaft to the top and flowed over. Great pumps had to be installed and a stubborn fight waged. Inch by inch the water receded until a diver was able to descend, the hole was plugged up with cement, and the men were ready for another try. Other accidents have occurred, many workmen have been killed—six only recently—but the work continues, and the promoters are confident of yet successfully reaching the rich deposits of rock salt for which such a tenacious fight is being made.

A task of considerable magnitude has been undertaken by the Automobile Club of America in sign-posting all routes marked in the club's tour book. More than 25,000 yellow metal arrows, bearing numbers corresponding to the numbers of the routes in the book will be used.

NEW HEAVIER-THAN-AIR FLYING-MACHINES

These illustrations show three of the latest heavier-than-air flying-machines built by European aviators. One of them is spoken of as "The Floating Green-house" because its planes resemble to some extent the glass roofs of such buildings. It has a double set of planes and was invented by Albert and Emil Bonnet-Labranche.

Another illustration shows the Vinar machine with its wings or planes folded. In this position the wings resemble those of a locust. The third illustration to be commented upon is the novel multiplane aeroplane which is being experimented with by the Marquis d'Ecquevilley.

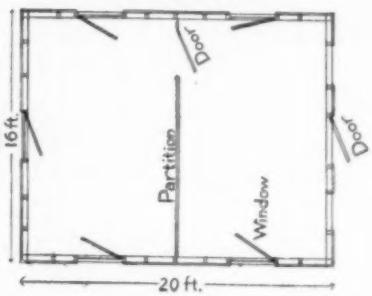


Aeroplane Known as "The Floating Greenhouse"—Flying-Machine with Locust-Like Wings—A Novel Multiplane Aeroplane

U. S. HOMES FOR THE HOMELESS IN STRICKEN ITALY

In the Italian earthquake story published in the March issue mention was made of the aid extended to stricken

U.S. Government Cottage in Stricken Italy



Italy by the people of the United States and the United States government. The most important part of the government program was the plan of sending and constructing 2,500 cottages in the earthquake zone, this plan meeting the desire of the Italian government. The work was carried out with the utmost dispatch, for Uncle Sam played the role of architect, builder and boss carpenter all in one.

The cottages, as shown by the plans, were of the 2-room type, with ample windows and doors. In their construction only six different sizes of lumber were used. The rafters, the studding, the caps and the corner posts were 2 by 6-in. pieces of lumber, the posts consisting of two such pieces nailed together. The sills were made of 2

by 6-in. material, and the floor beams were of 2 by 10-in. material laid with 12-in. centers. The siding was 6-in. bevel, laid 4 in. to the weather, and the floors were constructed of ordinary planed pine boards, one inch thick.

The windows of the cottages are single sash, opening inward on side hinges. Seven such windows were built into each cottage. Sufficient glass, cut to the required dimensions, accompanied the sashes. Framing for the windows and doors were supplied in the required lengths for putting in, and hinges and locks were fitted to the doors, in order to save all possible time in construction. The roof of each cottage was covered with a single layer of patent roofing, made fast by wooden strips, or by cement and roofing nails, supplies of both being sent. All nails required, and tools for the workmen were sent with the other supplies.

The general supervision of the work was undertaken by a superintendent of carpenters and his assistants, sent out by the United States Navy, under whose auspices the work was done. Immediately upon the arrival of the first steamer at the place where the buildings were erected, a model cottage was built by the United States carpenters as an example of how the work should be done, and to show that two good workmen could erect such a house in three days and have ample time to spare.

In the construction of the cottages, each of which is 16 ft. wide by 20 ft. long, more than 7,500,000 ft. of American lumber was required. The approximate cost of each cottage was $150, whereas a portable house of similar size would cost $300, a saving by Uncle Sam of 50 per cent.

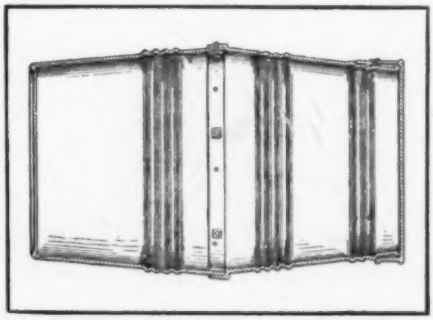
The specifications and instructions for the men employed in constructing the cottages were printed on the plans in Italian as well as English, as it was necessary to have Italian carpenters do part of the work. Reports say that one of the streets on which the houses were constructed will be given an American name.

GUARDING THE GOLDEN GATE

The "Mile Rock" lighthouse, guarding the southern side of the entrance to San Francisco harbor, rises straight from the ocean when the tide is in, as its foundation is then entirely under water. It was built on a sharp pinnacle of rock, and its lower part is a steel cylinder filled with concrete. This cylinder is elliptically-shaped, and rises to a height of 40 ft. The upper part of the lighthouse is constructed of structural steel. The height of the light from the surface of the water is 100 ft. The total cost of the work, which was only recently completed, exceeded $100,000. The structure is exposed to all the gales of the open sea, the fury of the breakers and the powerful tidal currents that sweep through the Golden Gate.

SEPARABLE METAL BARRELS

An economical retainer in which to ship products such as cement, lime and plaster has been a problem with manufacturers for some time. A package of barrel form is ideal, but wooden barrels are constantly increasing in cost and are good for only one shipment,



For Shipping Cement, Lime, Plaster, Etc.

as the cost of returning empty wooden barrels to the shipping point is prohibitive. The metal barrel shown in this illustration goes a long way toward solving the problem, as the halves are separable and can be nested in a compact form for the return journey. The cost of the barrel is about $1, which is a little more than twice that of a wooden barrel, but they are claimed to be good for at least 15 round trips, and the room they occupy when empty cuts down the shipping bill one-half.

ONE RESULT OF A HOUSE-CLEANING LAW

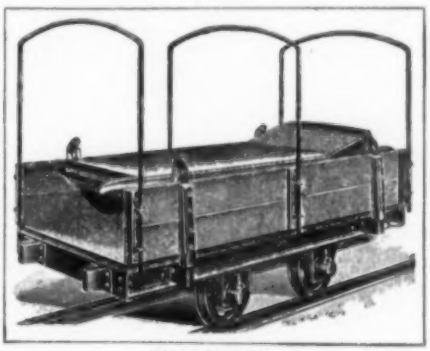
No one would ever again doubt the excessive cleanliness of the Japanese as a race if compelled to traverse one of the streets of a town during house-cleaning time. The Japanese authorities take the greatest possible care to prevent the spread of the plague or other diseases, and in Kobe, which is one of Japan's seaports, every house is cleaned under the supervision of the sanitary authorities twice a year.

In Kobe one street is dealt with at a time, and everything is taken out of the buildings and piled in the roadway. Dust and refuse are carted away and burned. In six months more than 56,000 homes were cleaned in Kobe alone.

Cleaning House in Kobe

MILITARY STRETCHER CARS IN INDIA

The stretcher car or truck shown in this illustration is designed for military purposes and a number of them are included in the rolling stock of the narrow-gauge or "light" railways of India. The road upon which they run has a gauge of only 2 ft. 6 in. As this is the same gauge as the portable railways for mining and on tea plantations in India the stretcher car can be used on these as well.



Used in India

The stretcher is suspended upon springs, steel loops being attached to the sides of the body of the car for securing an awning.

PURE COPPER NUGGET WEIGHING THREE TONS

A pure copper nugget weighing 6,000 lb. was found recently in the Chittina district of Copper River Valley, Alaska, and its finder and owner is undertaking to transport the huge 3-ton lump of metal to Seattle for exhibition at the Alaska-Yukon-Pacific exposition. It is claimed that the nugget is the largest lump of pure copper ever found in any part of the world. Its trans-

portation from its native bed to Valdez was the most difficult part of the task. According to the contract, this part of the journey alone cost the owner of the nugget $1,800.

ADVERTISING WITH AN AIRSHIP IN MEXICO

A hustling tobacco firm in Mexico, not satisfied with covering the land with advertising, has chartered an American dirigible airship, and its inventor, to make a number of flights each week in different parts of the Mexican republic. Banners fastened to both sides of the gas bag advertise the company's latest brands of cigarettes. —Contributed by Alphonse F. Arce, Mexico City.

The English railroads have not killed anyone during the past 15 months.

JAPAN A BREADLESS COUNTRY

Japan always has been and is yet practically a breadless country. The "staff of life," older than Christianity, and the main food of many classes and nationalities, was not known in Japan until the Portuguese first entered that country in 1542. Rice, beans, fish, eggs, and millet were and are still the chief articles of food. In 1890 there was a rage for foreign bread in Tokio, even among the coolies, and piles of it were seen in every little cook-stall, but the fashion subsided like a fever, and ordinary Japanese victuals resumed their wonted place. The American boy looks for a piece of bread, often well buttered and sugared, on his return home from school or play; the Japanese boy expects rice.

The German navy department has ordered "hurry-up" work on six new submarines.

LARGEST CHRYSANTHEMUM IN THE WORLD

The largest chrysanthemum plant in the world, grown by a lover of flowers living at Greyston-on-Hudson, N. Y., was recently exhibited in New York. It is of a Japanese species, and although but one year old, is 10 ft. in diameter and has 1,200 blossoms.

A Plant with 1,200 Blossoms

GERMANY'S MODERN WAR AUTOMOBILES

A year or two ago Germany commanded the attention of the world in her military experiments with automobiles. Today the world is following as closely as possible—and permissible—her progress in building a fleet of aerial fighters. Whether or not Germany will hold supremacy over the other powers in this last move has yet to be demonstrated, although she is far in advance now, but without doubt her equipment of military automobiles is, and always has been, greater and more varied than that of any other two, perhaps three, powers combined.

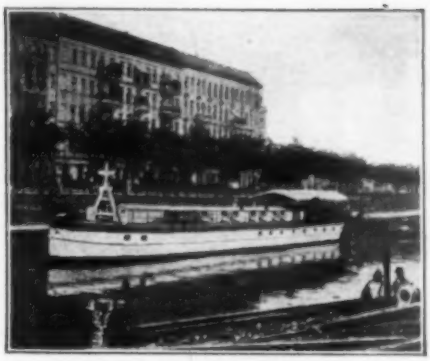
One of the most interesting of these is an armored car for use either as a

One of Germany's Military Autos

moving battery, or as a transport for light field guns from place to place in the zone of fire. It is a cumbersome vehicle, but protection rather than speed was the consideration.

FLOATING CHURCH IN GERMANY

One of the most curious boats on the River Spree in Berlin is the floating church here illustrated. It has a fine altar and many seats for the accommodation of the bargemen and their families, the majority of whom cannot be



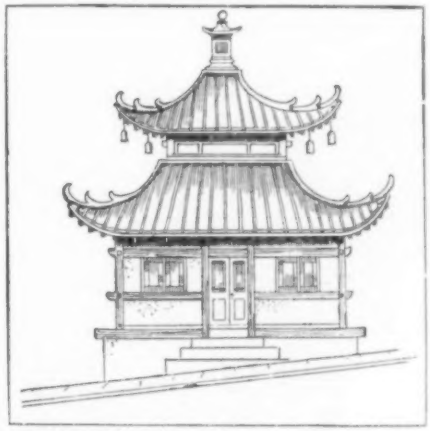
A Floating Church on the River Spree

persuaded to go into the churches on land.

SAN FRANCISCO'S CHINESE TELEPHONE EXCHANGE

One of the most interesting features of the rebuilding of San Francisco's famed Chinatown is the new telephone exchange building to handle the large number of calls from that quarter. The building is designed on Oriental lines, and, when completed, will be ornamented with dragons and other symbolical Chinese characters.

The Chinese are great users of the telephone, as their language is cumbersome, and they would rather talk



Courtesy Jour. of Electricity

Chinese Telephone Exchange

over the 'phone than write letters. The operators will be Chinese boys, Chinese girls being at a premium.

ANOTHER STYLE OF MISSION CHAIR

The material necessary to make a mission chair as shown in the accompanying illustration may be secured from a planing mill with all four surfaces squared and sandpapered. The mill can do this work quickly and the expense will be nothing compared with the time it takes to do the work by hand. The following is the stock list:

4 legs, 2½ by 2½ by 32½ in.
2 bottom end rails ⅞ by 5¾ by 23½ in.
2 bottom side rails ⅞ by 5¾ by 28½ in.
2 top end rails ¾ by 4½ by 23½ in.
1 top back rail ¾ by 4½ by 28½ in.
2 cleats ⅞ by 2½ by 26½ in.
7 slats ½ by 2 by 24 in.

This design was purposely made simple. If it is considered too severe and the worker has had some experience in woodwork, it can easily be modified by adding vertical slats in back and sides. These should be made of ½-in. stock and their ends should be "let into" the rails by means of mortises.

Either plain red oak or quarter-sawed white oak will do. Begin by squaring up one end of each leg, marking and cutting them to length and planing up the second ends so that they shall be square. Both the top and bottom of each leg should be beveled or rounded off about ¼ in. so that they may not splinter or cause injury to the hand.

When all of the legs have been made of the same length, set them on end in the positions they are to have relative to one another and mark with pencil the approximate locations of the mortises. Next, place them on the bench, side by side, even the ends and square sharp lines across to indicate the ends of the mortises. The drawing shows the dimensions to use. A sharp pencil should be used for this marking and the lines should be carried entirely across the two faces of each piece.

Set the gauge for the side of the mortise nearest the face edge. With this setting, mark all the mortises, then set for the second side of the mortise and complete the gauging.

There are two ways of cutting small mortises in common use. One is by using a chisel of a width just equal to that of the mortise. The other is by using a smaller chisel after the mortise has first been bored with the brace and bit. In the first method the cutting is begun at the middle of the mortise where a V-shaped opening is made the full depth of the mortise that is to be. Continuing from the middle, vertical cuts are taken first toward one end then toward the other. The chips are pried out as the cutting proceeds. In making the last cut this prying must be omitted, otherwise the edge of the mortise would be ruined. It will be necessary to stand so as to look along the opening in order to get the sides plumb.

This method of cutting, when once the "knack" has been attained, will be found much easier, quicker and more accurate for small openings, such as these, than the usual method. The second method, which is the usual one, needs no description.

The rails should next have the tenons cut on their ends. It may not be out of place to remind the amateur that the lengths of the various like pieces can best be laid off by placing them on the bench, measuring off the proper distances on one of them and then with trysquare marking across the edges of all of them at once. This not only saves time in that but one set of measurements need be made, but it insures all of the pieces being similarly laid

off. In measuring off for the shoulders of the tenons, begin at the middle of the length of the rail and measure half of the distance each way. By doing so, if there are any slight differences in the lengths of the pieces this difference will be divided between the two tenons and no harm will be done.

In gauging the tenons take the precaution to mark a working face and joint edge, even if all the surfaces were finish-planed at the mill. It is very important that all tenon gauging be done from these faces. The same is true of the legs or posts, and the slats if there are to be any.

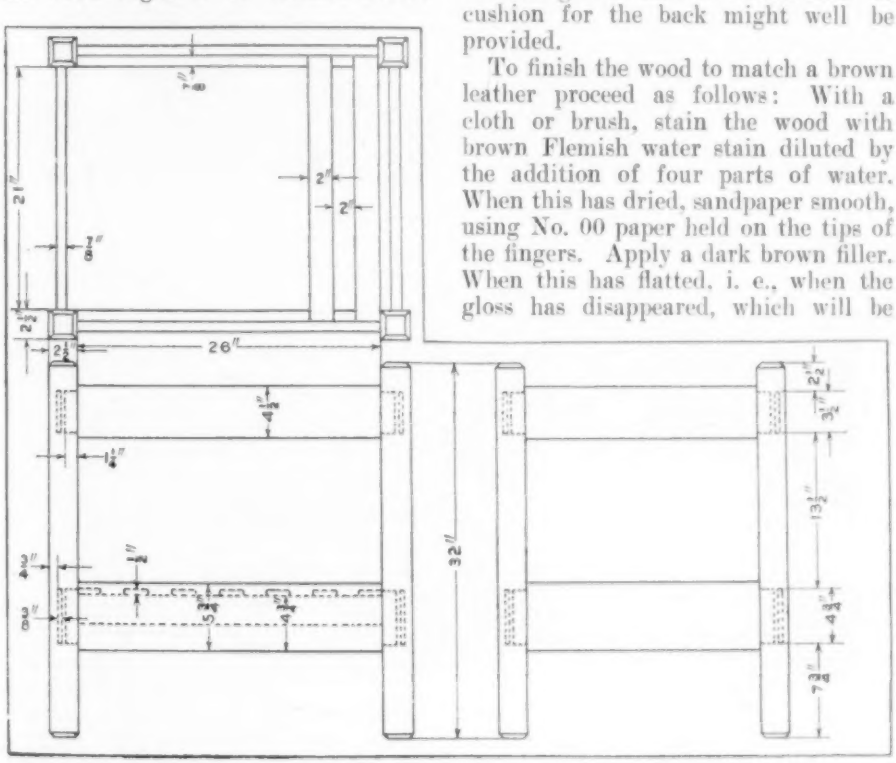
To avoid confusion it is well to number each tenon by means of the chisel with a Roman numeral and its corresponding mortise with the same. This will prevent the fitting of one tenon into more than one mortise.

Put the parts together with warm glue if it can be had, otherwise use the prepared cold glue. In cold weather the wood ought to be warmed before the glue is applied. Put the ends of the chair together first. When the glue has set on these put the other rails in place.

When clamping up the second set of rails make sure the frame of the chair is square. The best way to test for squareness is to measure the diagonals with a stick. Spring the frame until they measure alike, using a brace to hold the frame in position until the glue can harden.

Before staining, scrape off any surplus glue, for stain will not adhere to glue and a white spot will be the result of failing to remove it. Fasten cleats to the front and back rails with screws. To these cleats fasten the slats as shown in the drawing. A cushion of Spanish leather, such as is shown in the photograph, can be bought at the furniture store or the upholsterer's. It can be made by the amateur quite easily, however. The two parts are fastened together with leather thongs and the filling is of hair or elastic felt. A cushion for the back might well be provided.

To finish the wood to match a brown leather proceed as follows: With a cloth or brush, stain the wood with brown Flemish water stain diluted by the addition of four parts of water. When this has dried, sandpaper smooth, using No. 00 paper held on the tips of the fingers. Apply a dark brown filler. When this has flatted, i. e., when the gloss has disappeared, which will be

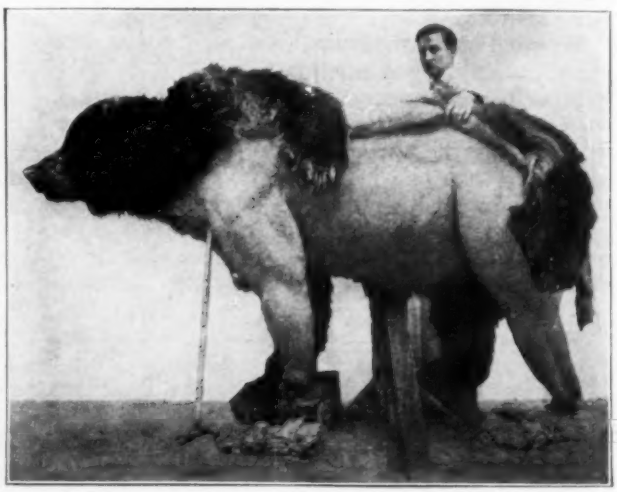


in the course of ten or fifteen minutes, wipe off clean with excelsior and then with waste or a cloth. Allow this to dry over night, then apply two or three coats of wax. Polish each coat with a flannel cloth by briskly rubbing it.

A settle can be made after this design by using longer front and back rails. Rails 42 in. between shoulders will make a good length for a settle.

DRESSING THE CLAY FORM OF A BEAR

The days when the skins of animals were stuffed with rags, straw, etc., for exhibition purposes, is long passed, and in the new taxidermy, the forms of large animals are entirely modeled in plaster and the skin is permanently glued on. These casts are durable, hard and waterproof and, being an exact facsimile of the original shape and muscular build of the animal's body, every bit of the anatomy can be satisfactorily brought out.



Modern Methods in Taxidermy

This skin, when alive, belonged to a giant bear in Alaska, which was shot after a dangerous fight. It is mounted in the Museum of Natural History, New York.

A HIGH SCHOOL AERO CLUB

A young men's aero club, affiliated with the Aero Club of California, has been organized by the students of the Los Angeles Polytechnic High School. The club has 40 members, divided into two sections, each of which is building a glider to be entered in the first meet of the Aero Club of California.

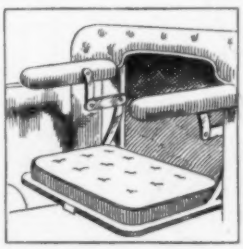
President Taft approves the lock system on the Panama canal.

WRECKED SHIP USED TO BUILD VILLAGE

That Robinson Crusoe was not the only man to avail himself of the opportunity offered by a wrecked ship to make his condition more livable on a tropical island, is clearly demonstrated by the thrift of the natives of the Island of Palmerston, far down in the South Seas. Following the wreck of a ship the natives began a rehabilitation of their village. Reed huts are torn down, and spars, oaken doors, hatches, partitions, and other flotsam cast upon the shore used in fashioning new huts.

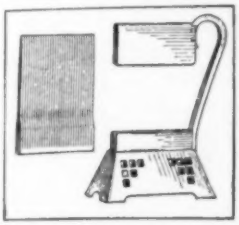
FOLDING AUTOMOBILE SEAT

An ingenious folding seat, part of the interior arrangement of a touring car of the double phaeton type with high doors, is creating considerable interest. The seat folds up entirely flat against the panel, the under side of the seat being so arranged as to appear as part of the panel when closed up.



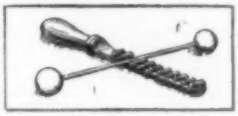
TOOTHPICKS IN BLOCKS

The toothpicks found in many of the French restaurants are in blocks, held in standards of the type shown in the illustration. The blocks are sliced into toothpicks, only the very bottom of the block being solid. When the customer wishes a toothpick he breaks one off of the block.



THE DUMB-BELL GAME

The idea of the game is to incline the stick so that the dumb-bell will run down it, and to bring it up with a jerk that will leave the dumb-bell balancing in the last hollow. Great dexterity is required to accomplish this, as the dumb-bell either runs off the stick altogether or comes to rest on the stick before it reaches the last notch. All parts are of wood.



HOW TO MAKE A ROLL TOP DESK

The materials for this roll top desk can be purchased from a mill dressed and sandpapered so the hardest part of the work will be finished. The wood must be selected to suit the builder and to match other articles of furniture. The following list of materials will be required:

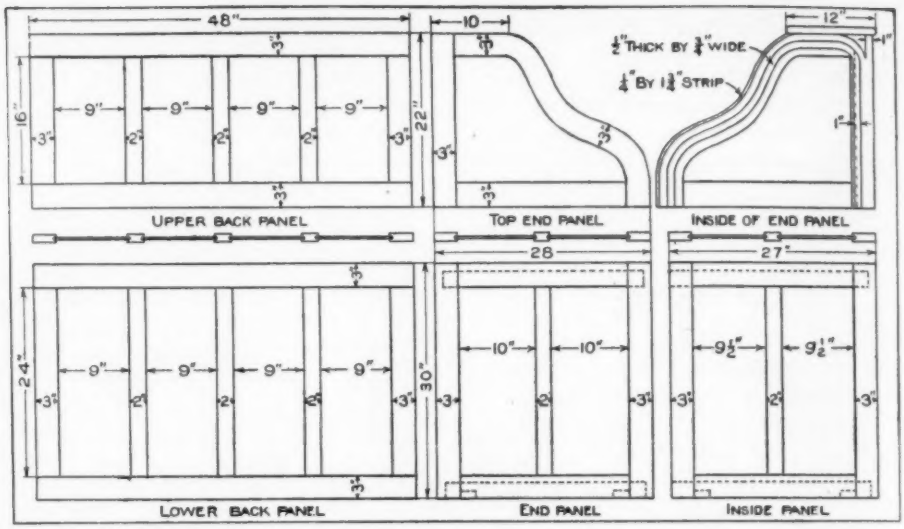
68 lineal ft. of 1 by 3 in. hardwood.
65 lineal ft. of 1 by 2 in. hardwood.
3 lineal ft. of ¼ by 24 in. hardwood.
45 lineal ft. of ¼ by 10½ in. hardwood.
36 lineal ft. of 1 by 12 in. hardwood.
35 lineal ft. of ⅝ by 9 in. soft wood.
100 sq. ft. of ½ by 12 in. soft wood.
1 piece 34 in. wide and 54 in. long hardwood.
30 pieces 1 by 1 in. 48 in. long.

The upper and lower back panels are constructed very similiar, the only difference being in the height. The inside edge of the 3-in. pieces are plowed with a ¼-in. plow ⅜ in. deep exactly in the center and also both edges of each 2-in. piece. The 16-in. pieces in the upper back panel and the 24-in. pieces in the lower back panel must be cut ½ in. longer and a ¼-in. tongue made on each end to fit into the plowed groove and form a mortise joint.

The upper back panel is filled in with four boards 9½ in. wide and 16½ in. long, while the four boards in the lower back panel are 9½ in. wide and 24½ in. long cut from the ¼-in. hard wood. When the grooves are cut properly, the joints made perfect and the boards fitted to the right size these two panels can be assembled and pressed together in cabinet clamps. This will make the outside dimensions as given in the drawing.

The end panels are made very similar to the lower back panel, the only difference being in the width of the filling boards, which are 10½ in. for the outside end panels and 10 in. for the inside panels. One end panel and one

The Desk Complete



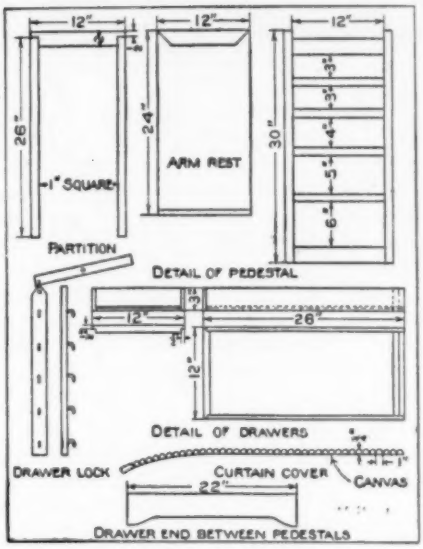
inside panel make the sides of one pedestal. As the end panels are 1 in. wider than the inside panels they overlap the back panel and cover up the rough end of the boards. A 1-in. piece 2 in. wide is fastened at the top and bottom of each end and inside panels as shown by the dotted lines. The lower back panel is fastened on by turning screws through the back and into the ends of these pieces. The bottom pieces have 2-in. notches cut out, as shown, into which to fit two cross-pieces across the bottom of the pedestal for holding the casters. The top end panels are made as shown in the drawing, the inside edge of the pieces being plowed out, making a groove the same size as in the other pieces of the panels. The panel board is cut to the proper shape from the ¼- by 24-in. material. The length given in the material list will be sufficient if the pointed ends are allowed to pass each other when laying out the design.

Instead of cutting a groove for the roll top curtain, one is made by fastening a ½- by ¾-in. strip ⅜ in. down from the edge and on the inside of the panel. A thin ¼- by 1¾-in. strip is bent to form the shape of the edge and fastened with round-headed brass screws. A 1-in. piece is fastened at the back and a groove cut into it as shown by the dotted line into which to slide a ¼-in. back board. The top is a 12-in. board 54 in. long.

As both pedestals are made alike the detail of only one is shown. The partitions upon which the drawers slide are made up from 1-in. square material with a 2-in. end fitted as shown. Dimensions are given for the divisions of each drawer, but these can be changed to suit the builder. The detail of one drawer is shown, giving the length and width, the height being that of the top drawer. The roll top curtain is made up from 1-in. pieces ¾ in. thick and 48 in. long, cut in an oval shape on the outside, tacked and glued to a piece of strong canvas on the inside. The end piece is 2 in. wide, into which two lift holes or grooves are cut and a lock attached in the middle of the edge. A drawer lock can be made as shown and attached to the back panel and operated by the back end of the roll top curtain when it is opened and closed.

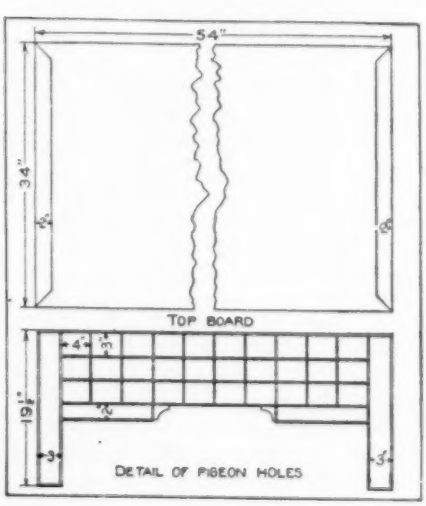
The top board, which is 34 by 54 in., can be fitted with end pieces as shown or left in one piece with the edges made rounding.

At this point in the construction of the parts they can be put together. The sides of each pedestal are fastened together by screws passed through the 1-in. square pieces forming the parti-



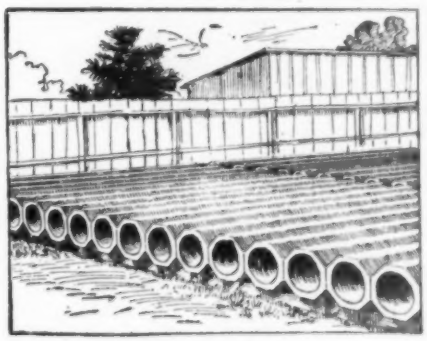
tion and into the sides of the panels. When each pedestal is put together the lower back panel is fastened to them with screws turned into the pieces provided as stated in making the end panels. The top board is now adjusted with equal edges projecting and fastened in position with finishing nails. As the top panels cover directly over where the nails are driven, the heads will not show. The upper back panel is fastened to the curved ends and the whole top held to the top board with cast corner brackets that can be purchased at any hardware store. The top should not be drawn together too close before the ¼-in. back board is put in the grooves and the roll top curtain placed in position.

The detail showing the pigeon holes gives sizes for 30 openings 3 by 4 in., two book stalls at the ends 3 in. wide and two small drawers. This frame is built up as shown from the ⅜-in. soft wood, and fastened in the back part of the top with small brads.



HOLLOW CONCRETE PILES

The hollow concrete piles shown in this illustration are used in a new seawall in the harbor of San Francisco.



Used in a New Seawall

They are octagonal, and have an outside diameter of 24 in., and a circular inside diameter of 19 in. Reinforced longitudinally with twelve ¾-in. steel bars and circumferentially with a spiral of No. 1 wire, they stand driving surprisingly well. A number of them were driven under a hammer weighing 4,600 lb. with an 8-ft. drop. They were cast horizontally, the concrete being wheeled directly over the forms and poured into the spaces for the piles.

That the use of aerial tramways is not limited to short distances is shown by one constructed at Grand Encampment, Wyoming, having a length of 16 miles.

DURABLE INCANDESCENT RODS FOR GAS LIGHTING

The ordinary incandescent gas mantle, so easily destroyed by a strong current of air or by being otherwise jarred, has a much more durable substitute in a new incandescent "bushlight" now being demonstrated in England. The actual incandescing material takes the form of a series of rods, clustered as shown in the illustration.

Besides the consideration of the light the clusters give, which is greater than that of the ordinary incandescent mantle, the most important feature of the system is the exceptional durability of the rods. Although sufficiently fragile to be broken by a deliberate attempt, it requires a very severe shock from without to affect them. Their rigidity, also, is said to render them practically immune from the effects of a severe draught and the destructive action resulting to the mantle from the continual lighting up and extinguishing of the burners.

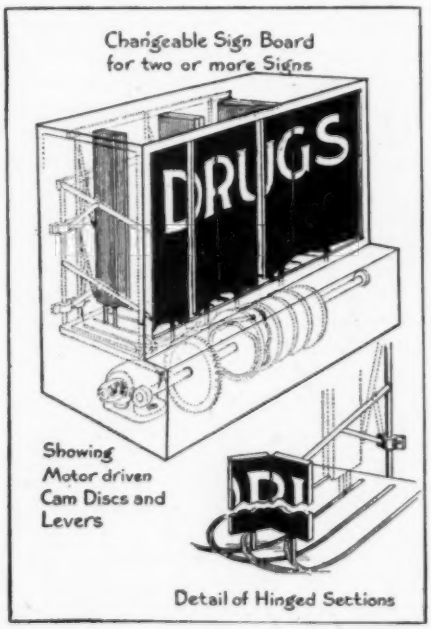
Although the rods shown are the most common form of the new fixture it is stated that the filaments can also be constructed as stars, baskets of flowers; or other desired shapes, and that the color of the lights can be varied by altering the chemical composition, thus making possible interesting schemes of decoration.

More than 400 fox skins were harvested on an Alaskan island fox farm recently. The pelts averaged $60 apiece.

WORDS AND SENTENCES CHANGED BY A NEW MECHANICAL SIGN

Various kinds of signs have been invented to attract attention of the passing public. Electric flash signs that will spell out a name of a short sentence have proven to be the best sort of street advertising. These signs have the one disadvantage of being used only at night. Herewith is illustrated a machine that may be constructed with any number of changes in spelling out of words and used as a sign for both day and night.

The mechanism is run by a small electric motor. Cams are fitted to a shaft in the lower part of the sign, and these cams operate levers which in turn operate hinged doors which are carried



For Both Day and Night

on the levers to the front. While one set of levers carrying hinged doors are going forward another set are returning, thus changing the letters stenciled on the hinged doors. This makes an appearing and disappearing action that does not fail to attract attention.

SPECTACLE HOLDERS FOR YOUNG CHILDREN

When very young children squint, or for other reason require glasses, doctors are often at a loss to know how to arrange them so that they will be held in their proper position without putting undue pressure on the delicate bridge of the nose. An English specialist, says Optical Journal, solves the problem by fastening a piece of tape, which may or may not be elastic, around the back of the head. This tape passes through eyes formed at the ends of the straight temples of the glasses.

MINING AND PREPARING MEERSCHAUM

The great meerschaum mines of the world are in Turkey, Asia Minor, but they are only great in the size of the white clay-like mineral found there, not in the manner of its mining. They are worked in the most primitive manner by a foreman and two to five workmen with picks. Sometimes the red earth in which the meerschaum is found is only a few feet, but ordinarly it is at a depth of from 60 to 120 ft.

These mines are not owned by private individuals, and permission to mine them is received on request to the Turkish administration. The pits at Nemlau are said to have been worked in this manner for the past 2,000 years.

The size of the nuggets of meerschaum rarely exceeds 12 to 16 cu. in., and the greater number are of the size of a walnut. The mines, which at one time reached from Kahe to Mihalitch, on the Sea of Marmora, are today reduced to about 1,300 pits, giving employment to but little more than 5,000 miners.

When the meerschaum is brought to the surface it is first cleaned by scraping with a special knife, and in this state it is sold to the local merchants, who dry and clean it, polish it with wax, and then sort it into qualities and sizes. There are 13 recognized qualities. The annual exports amount to 5,000 cases, with an approximate value of $260,000.

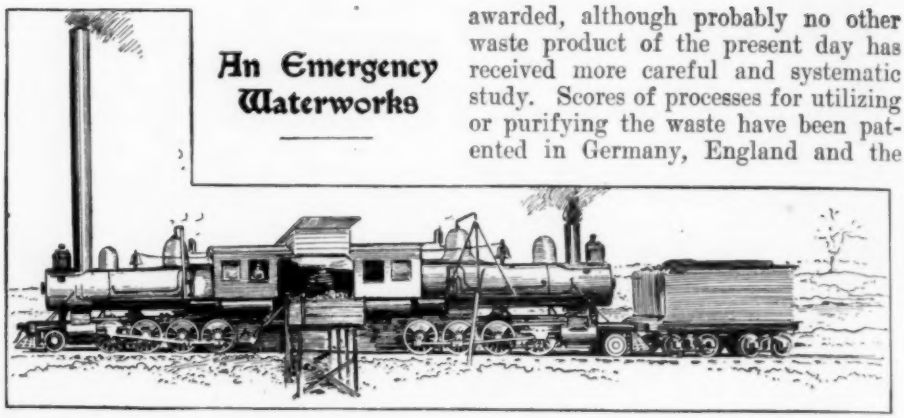
CHINESE ATTACH WHISTLES TO PIGEONS

In China it is not uncommon to hear a melody of soft sounds, and on looking upward to locate them, discover that they are made by flying pigeons. Pigeon whistles are much favored in China, especially in Peking. They are made of bamboo tubes, or of gourds, and attached to the tail-feathers of the birds, the sounds being made by the rush of air through them while the pigeons are in flight.

Whistles in Flight

The shipbuilding plants in Baltimore turned out 39 ships during 1908, the total value of which amounts to $1,476,900.

An Emergency Waterworks



During the water famine last summer and fall, caused by the exceptional dry spell, the officials of the railroads had to develop considerable ingenuity to meet the demand for water in the shops and roundhouses.

One of the most novel pumping stations thus made necessary was installed by the Pennsylvania railroad at Lloydell, Pa. Two engines were backed together, with tenders removed, on a siding running along the edge of a stream of water, and a staging was built between them for coal. To get the necessary draft for the engines' fireboxes, a stack 50 ft. high and 2 ft. in diameter was fitted over the stubby funnel of one of the engines, and for the same purpose a steam jet was placed in the funnel of the other. Two pumps were placed in position and connected by steam pipe lines to the domes of the engines.

POLLUTING STREAMS WITH WASTE MATERIAL

More than 3,000,000,000 gal. of waste liquors resulting from the manufacture of paper pulp by the sulphite process are annually discharged into the streams of the United States. Of this enormous amount 10 per cent by weight, or more than 2,500,000,000 lb., is solid matter, mostly organic and of an extremely undesirable character. A prize of $2,500 was offered in 1894 by Denmark for the best means of preventing this pollution, but it still remains unawarded, although probably no other waste product of the present day has received more careful and systematic study. Scores of processes for utilizing or purifying the waste have been patented in Germany, England and the United States, but none of them has been sufficiently successful.

A PORTUGUESE STRAW RAINCOAT

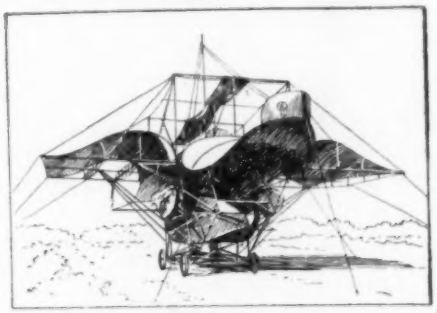
In some parts of Portugal the shepherds and sometimes men of other vocations wear mantles made of straw. These garments envelop the entire body and keep out the heaviest rain. Straw

Shepherd Wearing Straw Coat

has been used for many ages as a protection from rain, the straw-thatched roof being the most familiar example, and it is a well-known fact that a properly constructed stack of wheat sheds water and protects the interior.

A KANSAS AIRSHIP

The Girard flying-machine, invented by Henry Lawrence Call, will soon be tested at Chanute, Kansas. The machine weighs 3,000 lb., and has



A Curious Idea

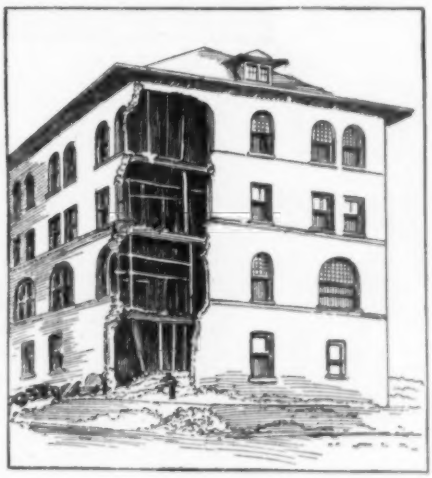
a canvas sustaining surface of 2,300 sq. ft. Seven adjustable planes are grouped around one central plane. The machine is driven by four propellers, operated by two 40-hp. gasoline engines, one on a side.

MOTOR HEADGEAR FOR WOMEN

Along with the first crude automobile came automobile headgear of all kinds and varieties for women, but every hat was as hideous as the cars were crude, serving only for protection and lacking as a chic adornment. Gradually the styles of automobile headgear changed, as is shown by these illustrations of a number of hats recently exhibited at the London automobile show. All of them are designed for the hard usage a hat necessarily receives on automobile trips, and some are as rakish as a gentleman's roadster.

TRAIN TEARS OFF CORNER OF 4-STORY BUILDING

In a collision caused by a switchman inadvertently turning a string of moving freight cars into a short spur track the corner of this 4-story office building of the Atlantic Coast Line railroad at



An Unusual Accident

Wilmington, N. C., was torn off for its entire height. The train of loaded cars was a long one and, it being dark, the crew of the engine which was pushing it was unaware that it had left the main track until the first car had struck and

New Style Motor Hats—From Motor, London

mounted the abutments, with the results shown.

The production of Portland cement in the United States for the year 1908 is estimated at 40,000,000 bbl.

The Completed Swing

AUTOMOBILES AS COWBOY STEEDS

Senator Warren in a recent discussion in the U. S. Senate declared that on his ranch in Wyoming automobiles are used to hunt up and save horses that have strayed, and that on several occasions his automobiles have been driven 200 miles to round up and save sheep that otherwise would have perished.

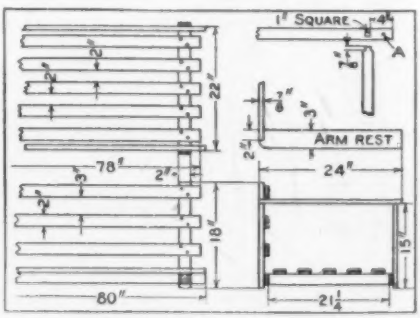
The statement was brought forth in the discussion attending the increase of pay and the expense allotment for the President, in which Senator Bailey, of Texas, offered an amendment to eliminate the words "other vehicles" so as to prevent the purchase of automobiles. He delivered a glowing tribute to the horse in which he said that it is the noblest of God's dumb animals and that he did not want to see it supplanted by a senseless machine.

According to other participants in the discussion Senator Bailey did not take into consideration the fact that a horse tires if driven a long distance on a hot day, and that the automobile saves this noble animal when substituted for him under such conditions.

HOME-MADE LAWN SWING

The coming of spring and summer calls forth various kinds of porch and lawn furniture. A porch or lawn swing to accommodate two or more persons is a thing desired by most people. The lawn swing as shown in the picture is portable and does not need stakes to hold it to the ground. While this swing is substantial and rigid it can be moved from place to place on the lawn, or the chains can be fastened with heavy hooks to the ceiling of a porch instead of using the stand. Either ropes or chains may be used to hang the swing and should be of such length that the seat will be about 20 in. from the ground or floor.

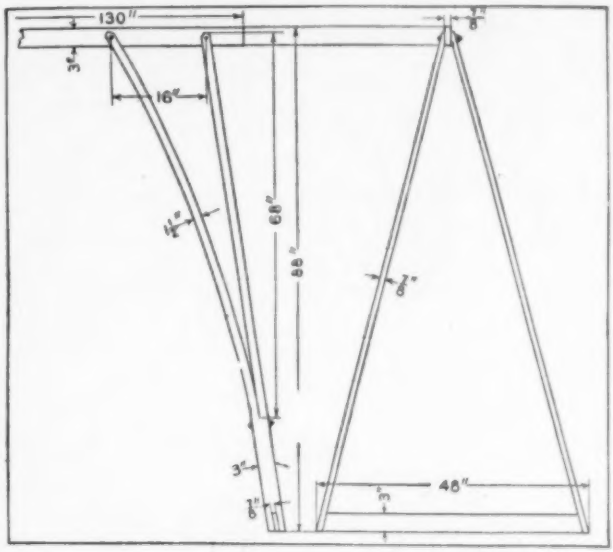
The drawing giving the dimensions for constructing the seat shows how the parts are put together. The front and back apron pieces are mortised to receive a 1-in. square tenon cut on the crosspieces that support the slats. Each end of the apron pieces extends 4 in., and a hole is bored at A into which the hanging ropes or chains are fastened. If ropes are used, bore the holes to fit the rope and when the end of each rope is put through a hole it is tied in a knot to keep from slipping out. Chains can be fastened with eye



Details of Seat

bolts. Small carriage or stove bolts are used to hold the slats on the framework and cross pieces. The arm rests are fastened with wood screws.

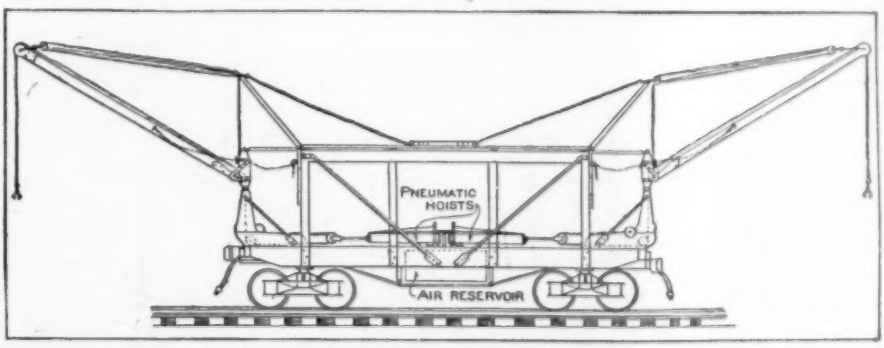
The drawing for the stand gives all the dimensions for its construction. Split the upright pieces or legs with a saw cut to the length as shown. A bolt should be put through each piece edgewise at the end of the saw cut, to keep the wood from splitting any farther when the ends are spread to receive the bolts through the cross pieces at the top. The upper ends of the ropes or chains are fastened close to and under the bolt holding the inside forks of the uprights. This bolt can be long enough to fasten a clevis that will hang underneath for this purpose. The whole swing can be painted with a forest green color which is very suitable for summer outdoor furniture.



DERRICK CAR FOR HANDLING RAILROAD RAILS

The increase in the weight of railroad rails in recent years makes the use of machinery for handling them a necessity. A number of railroads have appliances for this purpose, but an unusual type is adopted by an eastern railroad. The machine consists of a flat car with a derrick at each end which is worked by a pneumatic hoist, taking air from the brake system. The car carries an air reservoir connected directly with the train line, and when this tank is to be filled the engineer allows the air pump to run the pressure up to 80 lb. When the train is moved a valve is closed, shutting off the connection between the train pipe and the reservoir. The reservoir will hold sufficient pressure to handle 20 rails after being shut off from the train line.

The accompanying illustration shows the construction of the derricks. Each cylinder operating a derrick has a pis-

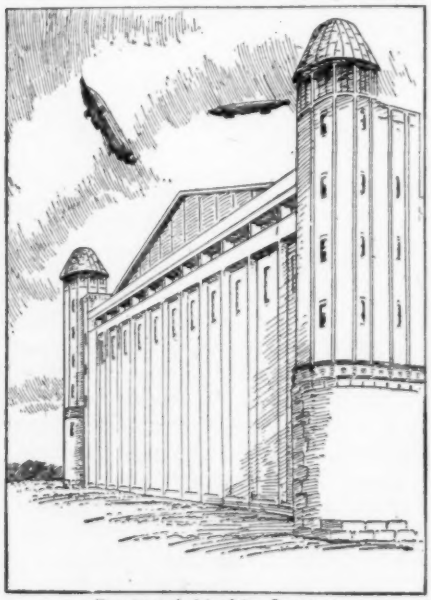


Car for Handling Rails with Compressed Air

ton with a travel of 7 ft., and a pulley is attached to the end of the piston rod. A full movement of the piston pulls the hoisting cable 14 ft. The hoisting cylinders for the two derricks are independent, each being worked by a separate air cock. Both derricks can be worked simultaneously in loading or unloading rails.

GREAT HOUSE FOR AERIAL WARSHIPS

So sure is Germany that the dirigible airship will be of great value in times of war that she is not only preparing to



Proposed Airship Garage

build a number of airships of the Zeppelin type, but plans have been made for a great garage or house in which to house her aerial fleet. It is proposed to erect the building at Friedrichshof.

DIRIGIBLE AIRSHIP TO CARRY FREIGHT

A new dirigible airship, invented by Professor Schuette, of the Technical high school at Danzig, Prussia, is designed to carry between 4,000 and 5,000 lb. of freight, in addition to the usual outfit and crew. The balloon will be 310 ft. long and about 50 ft. in diameter, and the skeleton frame will be made of double diagonal wooden ribs, instead of aluminum. The car or basket will be 120 ft. long and 12½ in. wide. The propelling force will be generated by two 150-hp. engines.

A WONDERFUL CLOCK IN SAN DIEGO

San Diego, Cal., has a wonderful clock with 20 dials, which tell simultaneously the time in all parts of the world, also the days of the week and the date and month. It stands 21 ft. high and four of its dials are each 4 ft. in diameter.

The master clock is enclosed in plate glass, so that every action can be seen, and the whole is illuminated every night. It is jeweled with tourmaline, topaz, agate and jade, and took 15 months to build. The motive power is a 200-lb. weight, which winds itself automatically. The cost of the clock was $3,000.

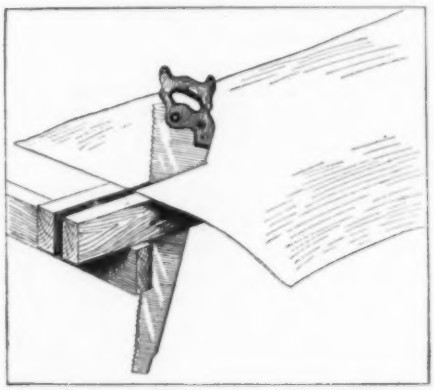
A ship recently sailed from Germany with 5,000 cats for Japan. They will be used to kill rats.

Work on the two 860-ft. White Star liners was commenced in January. They will be the largest ships afloat.

SHOP NOTES

Cutting Tin with a Hand Saw

A carpenter's kit of tools does not usually contain a pair of tin snips, and when he is putting on siding or finishing a fancy gable, he finds it necessary to use some tin strips. The tin can be cut with the back of a hand saw. Place two pieces of material having straight edges together on a pair of

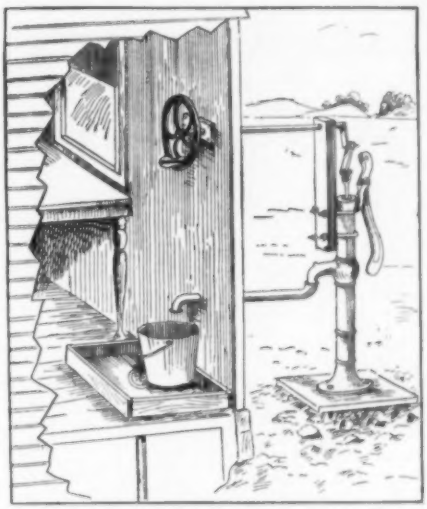


The Saw Blade Cuts the Tin

horses. Nail another piece across the bottom of the parallel pieces and put the saw in between them. Place the tin flat on top of the pieces back of the saw and pry down on the saw handle, as shown in the sketch, and the back of the saw blade will cut as good as tin snips.

Outside Pump Operated from Within a House

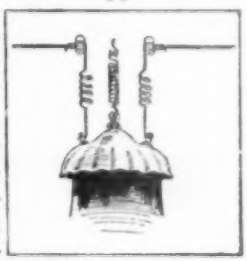
The accompanying sketch shows a method of operating a pump situated outside of a building while the operator is on the inside. This device can be used on a pump where the well is close to the house. A shaft and crank operates a pitman that drives the pump rod. The shaft is fitted with a hand crank wheel on the inside of the building. An extension spout allows the water to run in the sink inside the house. — Contributed by Harry R. Bowers, Altoona, Pa.



A Shaft Operates the Pump

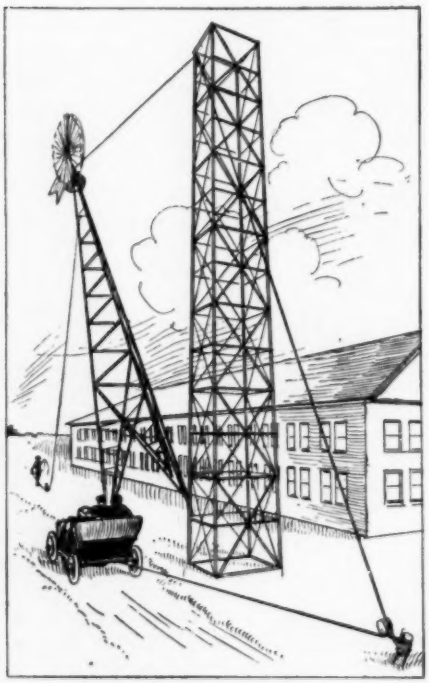
Arc Lamps Hung on Coil Springs

Considerable trouble was experienced in a textile mill with the upper carbons in inclosed arc lamps slipping through the clutch caused by the vibration. This was remedied in an inexpensive manner, as shown in the accompanying illustration. The lamps were suspended on a coil spring 6 in. long. Springs used for this purpose must be made in such size as to carry the weight of the lamp and yet have sufficient resiliency to take care of the vibration.



Erecting Windmills with an Automobile

The accompanying sketch shows how an automobile assisted in erecting a



Hoisting the Windmill

tower for a high windmill. Instead of using horses and a windlass the rope was attached to the rear end of a 20-hp. automobile which hoisted the tower into position easily. The rope ran over single pulleys and no tackle was necessary.

Home-Made Engine Room Chair

Secure an old sugar barrel and saw out a part of one side as shown in the sketch. Bore ½-in. holes 2 in. apart on the line where the seat and back are to be placed and make a network of baling rope to hold the cushions by running the rope through the holes. The cushions are made from excelsior and covered with burlap or cloth.

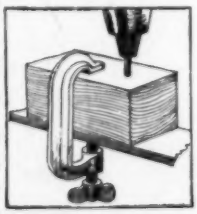
Moving a Tank by Floating in Artificial Pond

The timber foundation of a steel water tank in Pittsburg, 25 ft. high and 40 ft. in diameter, with a capacity of 235,000 gal., became decayed after 10 years of service, and it became necessary to substitute a concrete foundation in its place. To allow of this the tank was moved horizontally from the wooden foundation by an ingenious method of floating.

Calculations were first made to determine how much water would be required to float it, and marks were made on the side of the tank to indicate the draft. An embankment was accordingly built large enough to surround the existing and the temporary foundation and posts were driven in the ground to form its temporary resting place. Water was then let into the artificial pond from an adjoining tank, and the first tank was floated over the posts. Before the water was let in the wooden foundation was pinned down with long drift bolts driven through into the ground. The water was then allowed to escape and the concrete foundation was constructed. When this was sufficiently set the pond was filled again and the tank floated back to its original position.

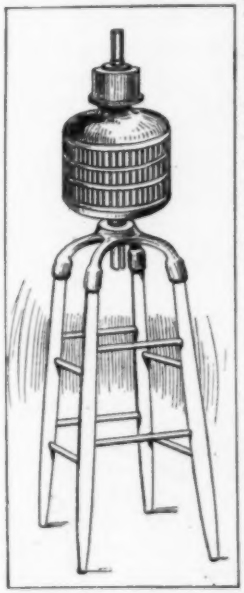
Safe Way to Use Small Drills

A small twist held in a breast drill chuck is very liable to break when drilling metal because of the pressure and the uneven pull on the gear wheel. Clamp a block of wood to the metal as shown in the sketch and drill the hole through both wood and metal and you will avoid the breaking of drills.



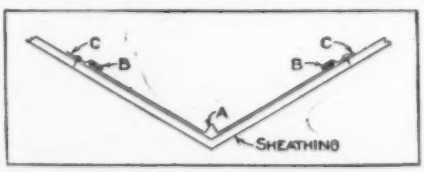
Stand for Holding Armatures While Repairing

When repairing, soldering wires to commutator bars or rewiring armatures the work is difficult unless you have your shop equipped with the necessary appliances. An armature is easily accessible when standing on end. This can be done by placing one end of the shaft in a hole bored in the bench for that purpose. The accompanying sketch shows a device used by an electrician which is even better than a hole bored in the bench. This person uses an old desk stool after removing the seat part. The armature shaft fits into the casting of the stool and holds the armature in a vertical position. Any part of the armature can be reached without having to turn it around.



How to Construct a New Copper Gutter

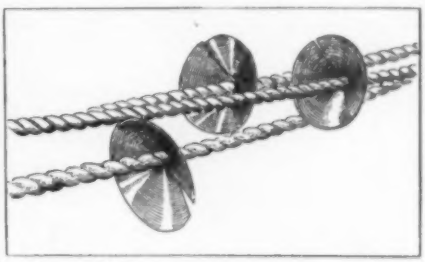
The gutters on large buildings are liable to buckle and crack, which will cause a leak, says the American Artisan. As there is no way of repairing old copper gutters except by soldering, the sketch shows the proper way to build a new one. The copper sheet is bent with a crimp in the lowest part of the gutter as shown at A, and fastened with a ½-in. turn over seam B to a clip C that is 1½ in. wide. This clip is fastened to the sheathing with copper tacks.



A Gutter That Will Not Crack

Keeping Rats from Climbing Ropes

The ropes used for tying boats to wharves provide a means for rats to enter the boat. Illustrated herewith is a device to place on ropes that will block the way of the rodents. A piece of tin is cut circular with a diameter of about 12 in. and a hole made in the center the size of the rope on which it is to be used. A three-cornered piece is cut out from one side so the tin can be slipped over the rope. When placing the metal on the rope, bend it slightly cone-shaped.



Rats Cannot Pass the Tin Disks

Keeping Moisture from Fire Alarm Boxes

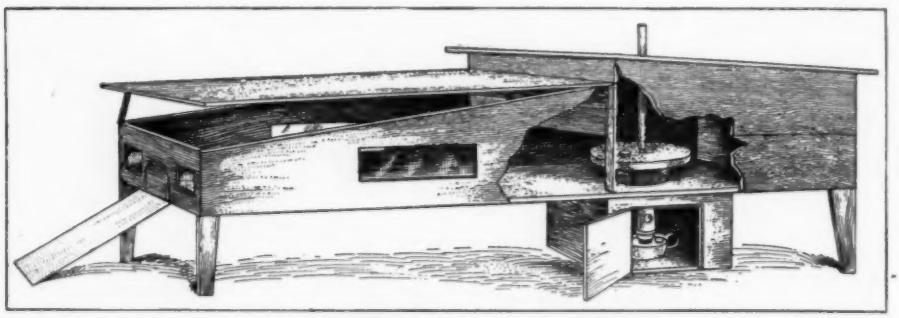
Fire alarm, police telegraph and all other metal boxes containing mechanism of any kind and which are exposed to the weather are not only liable, but do collect moisture, causing the different working parts to rust. This makes the instruments unreliable and greatly shortens their life. This fault can be easily overcome by placing heavy blotters in the boxes to take up the moisture. These blotters should be changed from time to time and the ones removed thoroughly dried out.—Contributed by Warren E. Fastnacht, York, Pa.

How to Make a Brooder

A brooder is necessary to care for little chickens after they come from the incubator. The beginner in the poultry business can make a brooder that will answer every purpose for the little chicks. First secure two boards 12 in. wide and 8 ft. long. From one end of each board make a mark 3½ ft. and cut the edges sloping toward the end, leaving the end 10 in. wide. Saw down 2 in. deep on the 3½-ft. line and cut the edges from that point toward the other end, leaving that end 8 in. wide. The end pieces are cut 2 ft. wide and of the proper width for their respective places. When these pieces are nailed together this will form the outside of the brooder. Boards are cut to the proper length and nailed to the straight edges of the sides to form the bottom. The top consists of two hinged covers made of boards held together with cleats and covered with oilcloth to shed water.

Cut a hole in the center of the bottom in the smallest compartment 5 in. in diameter. Holes are cut and glass supplied for windows in the larger division as shown. The windows in the sides are 4 by 10 in. A small hole is cut and a door fitted in the end, and a board, covered with coarse cloth, extends to the ground to provide a runway. Windows may be put in on each side of this door if desired. The heating device consists of a hollow disk or pan made of galvanized iron with a hollow cylinder soldered to the bottom. This cylinder has double walls with the center of such a diameter as to fit over a metal lamp chimney. The lamp chimney extends up into this cylinder and a small pipe is put through the disk and soldered. This allows the heat to pass through both cylinder and disk and the heat is then carried out through the cover with another extension of the small pipe. A heavy screen is cut and formed into a cylinder 4 in. high and of a diameter sufficient to keep the chicks away from the hot tin.

A box about 1½ ft. square is made and fastened to the under side in which to place the lamp. This box should be provided with a hinged door and also some holes should be bored in the sides near the bottom for air. A common incubator lamp is used for making the heat. The legs are 23 in. long, of which 8 in. are used in nailing to the sides of the brooder. A partition should be put in, filling the space to within 4 in. of the floor and between the compartments. The right temperature can easily be obtained by regulating the lamp.—Contributed by Charles E. Euret, Logansport, Ind.

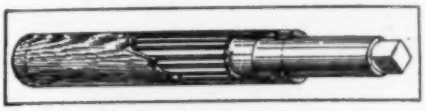


The Brooder Keeps an Even Temperature

Proper Care of Reamers

Great care should be taken to keep the flutes in reamers from sand or dirt that may collect in the place where they are stored. Sometimes reamers are kept in drawers where they can roll about striking together, causing the edges to become nicked or worn by the dirt. A simple method of keeping reamers in good condition is shown in

the illustration. A piece of hard wood is bored to the size of the reamer and then turned up on the outside, leaving



Receptacle for Reamers

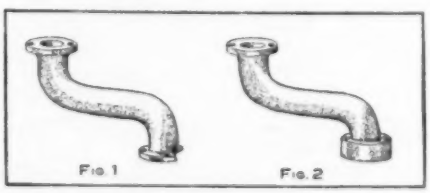
about $\frac{1}{8}$ in. of material as a shell. This forms a round covering into which the reamer can be inserted before storing away. Reamers kept in receptacles of this kind will cause no trouble in boring to the proper size.—Contributed by H. D. Chapman, Wishington, D. C.

Repairing an Aluminum Intake Pipe on an Automobile Engine

An automobile was brought to our shop with the aluminum intake pipe broken on the end that is held to the cylinder with cap screws. One-half of the flange and a piece about 1 in. square was broken out, as shown in Fig. 1. Our man, who does the aluminum soldering, was not in and the car had to be ready for a long trip the same evening. We could not get a duplicate of the pipe from the agency of the machine, so it was for us to fix it, or, as Bill said, "to make good."

We first put a piece of heavy asbestos in the end of the pipe, then fastened the pipe upright to a smooth piece of sheet iron by means of a bolt through the one good hole left in the flange. We then made a mold of ordinary tin to fit the unbroken half of the flange, reversed it to the broken side and bent the tin to make the other half-circle around the unbroken side.

The flange was $\frac{3}{8}$ in. thick and broken

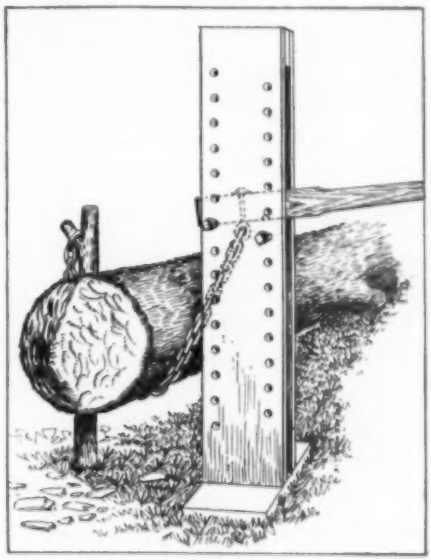


Repair on the Aluminum Pipe

part extended 1 in. above the flange. The ends of the tin were soldered together to form a complete circle around the flange and extending $\frac{1}{2}$ in. above the broken part. We then poured hot babbitt metal into the mold thus formed, and when cold the two holes were drilled through the babbitt and the pipe put on the engine with longer screws. As far as the repaired part of the intake is concerned the pipe is as good as a new one.—Contributed by G. H. Loose, San Francisco, Calif.

Home-Made Log Jack

The accompanying sketch shows a device to raise logs to be cut in stove wood or post lengths. Two boards are bolted together at each end with a 2-



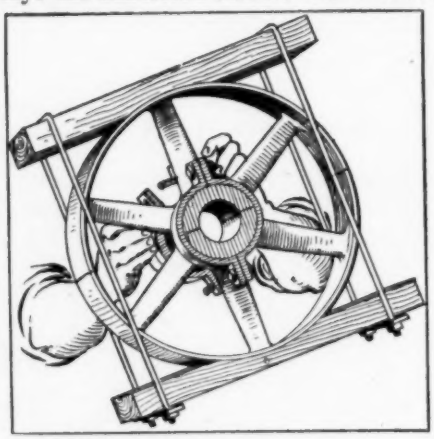
Hoisting a Log

by 4-in. piece between them. This forms an opening into which a lever is fitted and worked on pins thrust through holes bored at intervals in the two boards as shown. A chain is fastened to the lever with an eye-bolt, the end passed under the log and the large link at the opposite end hooked over one limb of a crotched stick. As the lever is worked up and down the pins

are pulled out and replaced in their turn farther up on the boards. A log can easily be raised to the proper height for sawing.

Home-Made Split Pulley

An old pulley on a line shaft in a mill broke and to supply a new one would necessitate considerable delay, says the American Miller. An unused

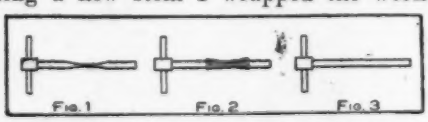


Putting the Split Pulley Together

pulley was found having the proper size, but it was not a split pulley and could not be put on the shaft. In order to make this pulley serve the purpose the pulley was sawed in half and bolted together with ½-in. straps on the hub. Wooden cleats were used on the face of the pulley, as shown in the illustration, to draw the parts together and make a perfect fit when the straps were bolted.

Repairing a Worn Carbureter Valve Stem

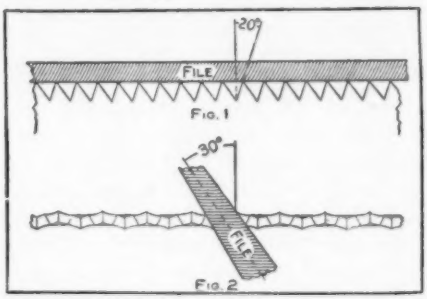
The gasoline valve stem on my automobile engine carbureter became worn, as shown in Fig. 1, by the action of the compensating valve. Instead of getting a new stem I wrapped the worn part level with fine brass wire, Fig. 2, and applied solder. After filing level and smooth the stem, Fig. 3, was as good as new.—Contributed by Dr. T. V. Simpson, Yorkton, Saskatchewan, Canada.



Worn Place Filled with Small Wire

How to File Hand Saws

Hand saws for sawing across the grain of the wood such as are in daily use by carpenters, cabinet-makers and others engaged in similar work are sharpened in the following manner: The first consideration is to properly set the teeth. This means to spread the teeth alternately on each side of the blade, so that when in use the blade will not bind in the kerf or cut made by the teeth. Setting is done with a saw set, which can be purchased from any hardware dealer. Be careful that the teeth are spread or set alike on both



Proper Angles for Filing the Teeth

sides, else the saw will not run in a straight line. Sufficient set is more or less a matter of judgment, founded on experience, and is relative to the character of the lumber to be sawed. Dry lumber requires very little set of teeth; just sufficient to let the blade nicely clear when in the wood to its full depth. Too much set is objectionable, for two reasons: The saw makes a very rough cut and in addition requires hard labor in removing unnecessary stock. Saws for green lumber require one-fourth more set than for dry. After setting, the next step is to straighten up the points of the teeth. This is known as jointing and is usually done with a 12-in. flat mill file; a file single

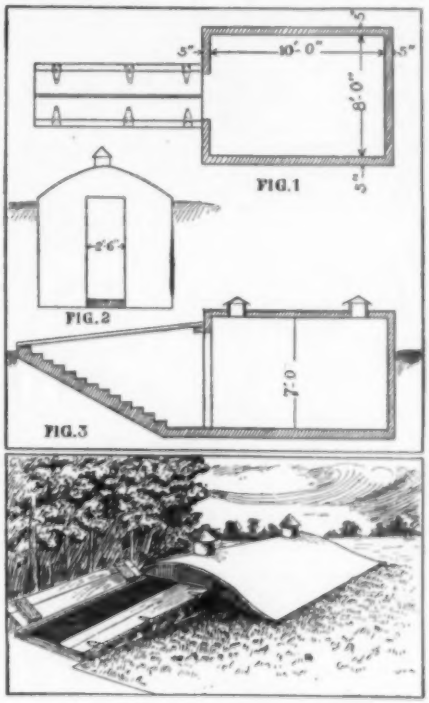
cut with a medium fine pitch of teeth. Use the file lengthwise of the saw blade as near as possible, as shown in Fig. 1, and not crosswise. Now file the teeth, using a three-cornered file for all saws, except the very finest tooth saws. For these a Stubs file should be used, as it has a much sharper corner. Hold the file slightly elevated at the point and filing across the teeth at an angle of about 30 degrees, as shown in Fig. 2. Bring them up to a keen point, going over all the teeth on one side from end to end before attacking those on the other side. Be careful to keep the teeth all of one size. Do not by careless filing get every alternate tooth large and small. The back slant of the teeth should be about 20 degrees, varying somewhat upon the thickness of the lumber. Saws for very thin lumber require more back slant than for heavier work. Saws for sawing lumber lengthwise of the grains are called rip saws, and their teeth should be filed with very little angle across the tooth and practically straight up on the cutting side of the tooth. Keyhole saws have the same teeth as a rip saw. After filing the teeth properly, lay the blade flat upon the work bench, and with the 12-in. mill file lightly touch the teeth on the flat sides to remove the burr caused by cross filing. A little practice will soon enable one to file saws so they will do good smooth work and run straight.

Attaching a Funnel to a Measure

A very handy device for filling oil cans, bottles and other receptacles with small openings is shown in the accompanying sketch. A funnel is attached to a measure with a small hinge. One end of the hinge is soldered to the funnel and the other to the measure. By using this device you have the two necessary articles always together, and in pouring the liquid is not easily spilled. —Contributed by Clarence F. Cooksen, Brooklyn, N. Y.

A Concrete Cyclone Cellar

Many farmers on the western plains have cyclone cellars. When boards and timbers are used to construct the walls the wood will rot out in a few years and have to be renewed, says Concrete Review. The accompanying illustration shows a cellar whose walls and roof are built of concrete. The walls are 5 in. thick and can be made by digging the hole sufficiently large to construct false work and leave an open space of 5 in. for the concrete. The roof is arched and the concrete can be put on false work to the proper thickness and smoothed over on the outside with a trowel. Tile with metal coverings over one end are fitted in the top

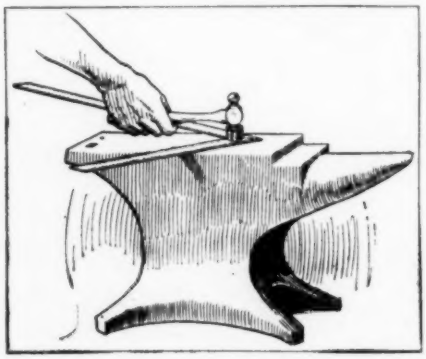


Plans for the Cellar

of the arch for vents. Fig. 1 shows the plan of the cellar with proper dimensions, Fig. 2 the doorway and Fig. 3 a cross section through the center. There is no danger of the roof blowing away or being caved in with a piece of flying timber.

Truing Up a Square or Saw

When a square is found to be out of true it can be straightened by the following method: If the arm of the square hangs out from the body part, or tends toward forming an obtuse angle, lay the square flat on an anvil, or other hard surface, and tap lightly with a small hammer, beginning at the inside corner as shown in the illustration, and increasing the force of the



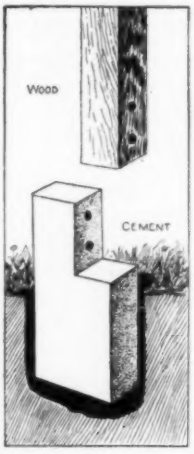
Hammering the Square

blows gradually as you proceed toward the outer corner. Continue the pounding in this manner until the arm is brought back to its proper place. If, instead of hanging out, the arm hangs in, tending to form a triangle, the treatment should be reversed. Go through the same operation as above described, only begin at the outer corner.

Kinks may be taken out of cross-cut saws in the same way. Sometimes saws are thrown away on account of the back being expanded too much, which will form a twist in the saw. Such a saw can be straightened if it is laid flat on an anvil and beginning at the end just back of the teeth hammered with even light blows until the other end is reached. Going over the saw a few times in this way will make the necessary expansion to straighten the blade. —Contributed by N. J. McLean, West Bay City, Mich.

Concrete Base for Wood Fence Posts

The difficulty of fastening the fencing material to cement or stone posts makes this kind of post objectionable. Herewith is illustrated a new idea in making fence posts. This post consists of a root or bottom of the post made of cement and the main post of wood. The wood is kept up from the ground and is not liable to decay, and if it does, another can be substituted easily, says a correspondent of the "Rural New-Yorker." The cement part is cast with a corner out, as shown, into which the wood post is placed and bolted with two bolts. When molding the concrete, run two smooth round sticks through the mold to make holes for the bolts.

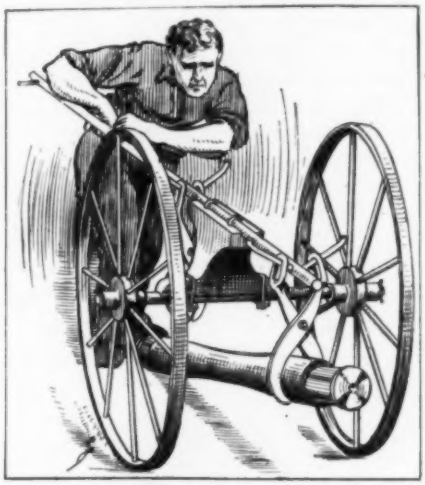


Fire Extinguished with a Stream of Steam

An overhead stack started a fire in the tarred roofing paper and threatened the whole plant of a large steam laundry. The owner conceived the idea of using steam for a fire extinguisher and soon had the flames subdued without the aid of the city fire department, says the Laundry Journal. Reducing flames by steam driven with force on a burning part of a building has been demonstrated before, but this is the first time that it has been used to a good advantage in a laundry fire.

Truck for Carrying Car Axles

This truck is a very useful and labor saving device for railroad shops. The main rod or tongue of the truck is 5 or



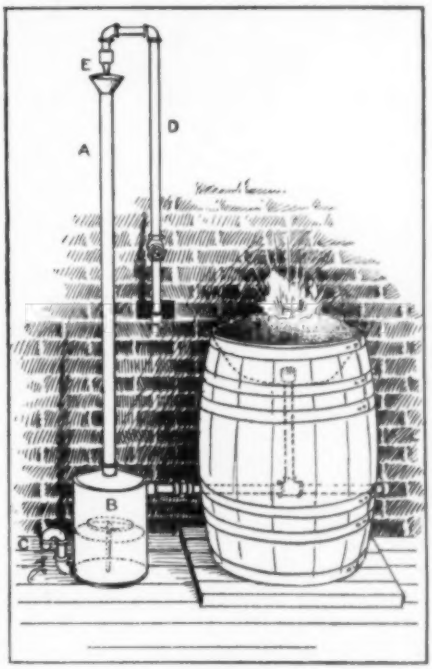
Picking Up an Axle

6 ft. long and of sufficient size to carry the weight of the largest axle. The wheels have a tread of 2½ in. and are from 2 to 3 ft high. The axle of the wheel is rigidly secured to the tongue with an anvil shaped casting as shown in the sketch. The horns for the tongs are welded to the tongue at an angle of 45 deg. and slightly bent at the ends to prevent the tongs being pushed off when picking up an axle. The sketch shows the truck tilted to pick up one end of the axle. When the ends of the tongs bear down upon the axle they are opened by the handles slipping up the slope on the horns. When the tongs slip over the axle they are closed by the weight of the axle, which also prevents it from falling out.

Automatic Blower for the Forge

A method for producing air pressure for use in blowing a forge fire is shown in the accompanying illustration. This device can be used where a water pressure of 20 lb. or more can be obtained. A 2-in. tin or galvanized iron pipe, A, is soldered into the top of a 5-gal. oil can, B. A 1-in. coupling is soldered into the side and at the top of the can, and a 1-in. pipe fitted into this coupling leads to the forge fire.

As a certain amount of water must remain in the can B at all times, a trap, C, made from pipe fittings is soldered in the side and at the bottom of the can. This will keep the water level to the height shown by the dotted line in the can B. The water main, D, is connected up to a place directly over the galvanized pipe, A, and fitted with a nozzle, E, that will reduce the water stream to $\frac{3}{16}$ in. There should be a space of 2 in. between the nozzle E and the opening in the tube A. The water entering the top of the tube A will carry some air with it and the water seal in B keeps a constant pressure in the can under the weight of the inflowing water. The pressure obtained will depend on the height of the tube A and the depth of the seal in the can.



Water Pressure Produces the Air Pressure

Collapsible Mold for Making Concrete Sewers, Bridges and Culverts

By A. A. Houghton, in Cement Era

The necessity of setting up and taking down forms in making molds for sewers, bridges and culverts of concrete work is a great waste of time, in addition to the great amount of lumber required. With the simple form described and illustrated herewith, which can be constructed by any one in a short time and at a slight expense, the labor in handling forms when molding all classes of bridges, culverts and sewers will be saved, as in a few minutes' time the form can be placed in position to mold a section, and by simply removing the key blocks the form will neatly fold together so that it can be removed and used again without delay in construction.

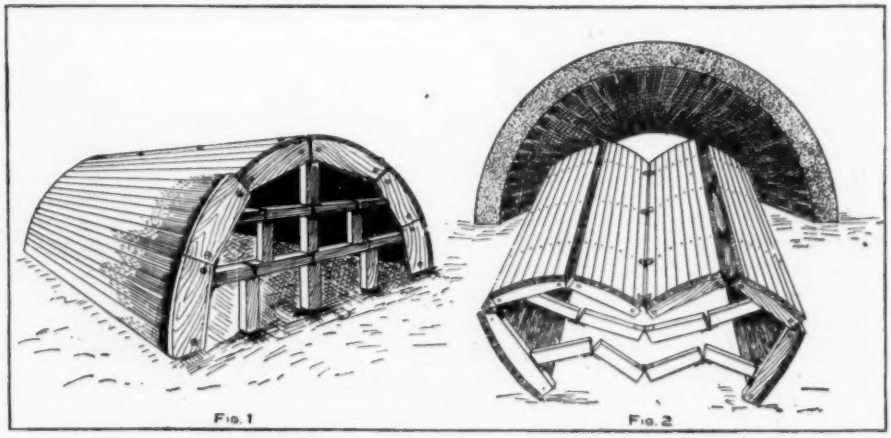


Fig. 1 Fig. 2

Removable Concrete Sewer Forms

The manner of construction for a culvert 6 ft. 9 in. wide and 3 ft. 4½ in. high when completed is to use for each section 24 one-twelfth segments of a circle, as four sets of six each are used as supports to each section. The best way to make these is to cut 24 pieces of 8-in. plank, 2 in. thick and 19½ in. long; take one of these pieces and make a pattern by marking on each end 1½ in. from the top on one side. In this 1½-in. space draw a curved line from the marks at each end, so as to bring the highest point of the curve in the center of the top edge of the piece. This will make one-twelfth segment of a circle of the desired diameter. In mitering the ends mark a point 1½ in. from each end along the bottom of the piece; then draw a line from this mark to the end of the oval line at the top and when this three-cornered piece is cut off the correct miter is obtained for the purpose.

If the length of the completed section is to be 12 ft. use lumber 2 in. wide and 1½ in. thick, of this length, lay four of the segments of circle with oval sides up at equal distance apart and cover with the 12-ft. lumber, nailing on top. The oval segments should be so covered as to leave ½ in. projecting on each side, this is planed down on one edge, in a bevel, even with the ends of the supporting timbers so as to make a tight joint when they are joined together.

After completing the six sections in the above manner join them together with a hinge on each support as illustrated in Fig. 1 and Fig. 2, requiring 20 hinges. As illustrated in Fig. 2, the hinges are all placed on the bottom side of supports, except those in the center on top; these must be on the outside to enable it to fold together. By using a flat strap hinge for this, there

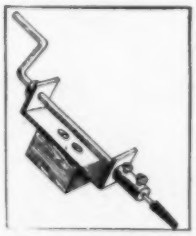
will be very little mark left in the completed work. For the cross supports cut four pieces of 2 by 4-in. lumber 4 ft. 10½ in. long. Each one of the bottom pieces is cut 1 ft. from each end and the balance of strip cut in the center, making four pieces; join together with three hinges as illustrated in Fig. 1 and Fig. 2, putting one hinge on top of the strip and two on the bottom, at the joints, and then fasten to the bottom supports with hinges, at bottom of the strip and fasten to the support at about the center. This allows these cross supports to break down as illustrated in Fig. 2, and thus folds the section together.

The top cross pieces or supports are cut from the same lumber 3 ft. 6 in. long, and are divided into four pieces, in a proportionate manner as the bottom cross supports, and are hinged together and fastened to sections in the identical manner as the bottom ones. This allows both cross supports to fold down alike, and thus draw in the sections together, so that it can be removed from the completed work in a very short time and without damage to the concrete.

As illustrated in Fig. 1 blocks are used to hold the cross supports in position while the section is in use. These should be at least 4 by 4 in. and the proper length to closely fit into the spaces. As illustrated, seven of these are used at each set of supports.

Home-Made Tapping Machine

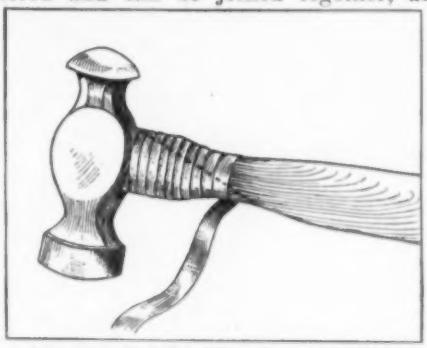
This machine is designed to be used for small taps which are too small for a large machine. The body is made from ⅛-in. sheet metal bent into the shape shown. A wood block can be fastened to the bottom with wood screws for holding the machine in a vise. The main shaft and crank consist of a ¼-in. rod bent to the proper shape. Chucks are made from short pieces of ¼-in. rod drilled in one end to fit the main shaft and the other to fit the desired tap. Several chucks are necessary for the different sized taps.



For Small Taps

Temporary Repair on a Hammer Handle

Hammer handles usually break near the hammer. If the break is not shattered and can be joined together, as



Hammer Handle Wrapped with Tape

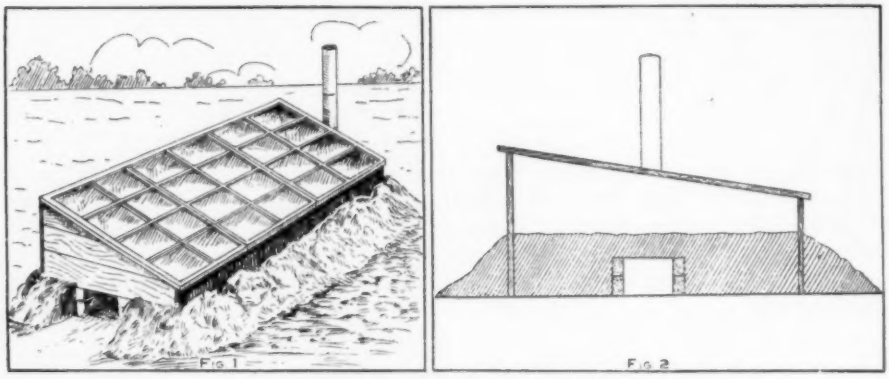
shown by the dotted line in the sketch, friction tape can be used to make the temporary repair. Wind the tape tightly around the handle, covering the break. I have used a hammer handle repaired in this way over a year.—Contributed by Ernest H. Alberty, Dyberry, Pa.

How to Fasten a Handle on an Umbrella

Sometimes a person would like to change some expensive umbrella handle to another umbrella and fasten it on solid. This can be done by cleaning out the hole left in the handle from the old rod and fill the hole with powdered sulphur. Place the handle in a solid upright position, and after heating the umbrella rod red hot push the rod down into the hole containing the sulphur. The hot rod fuses the sulphur and when cold it will hold the rod solid. This method may be applied to fastening rods into stone, iron or wood.—Contributed by Richard A. Booth, Providence, R. I.

Furnace to Heat a Hotbed

The satisfactory way to produce early plants is with a hotbed. The manipulation of a hotbed with manure is a very uncertain thing and the failures are many with those who first use them,



Artificial Heat Applied to a Hotbed

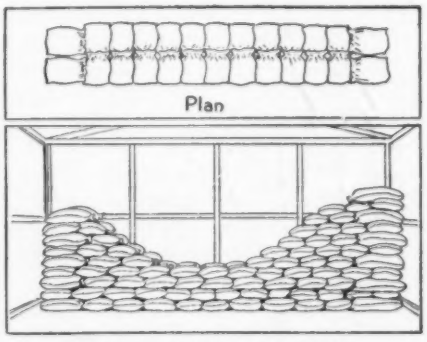
says a correspondent of the Country Gentleman. A hotbed constructed as shown in the illustration will give the best results, and the heat may be regulated with very little practice. This hotbed is built up in the ordinary way with window frames, as shown in Fig. 1, the only difference is that it has a small furnace at one end and a common stovepipe at the other. A cross section of the hotbed is shown in Fig. 2.

The furnace may be constructed of brick, stone or cement, and extends the entire length of the bed, with a small door at the end opposite the pipe. This door must fit tight, so that the draft may be controlled. An incubator thermometer should be used, by placing it in the top of the soil, and the bed should be supplied with a fire for several days before any seed is planted.

Piling Sacks of Cement

When building a dam on the North Platte river in Wyoming the engineers desired a system of storing cement in sacks which has many advantages over the old methods. Sheds 18 ft. wide, 8 ft. high at the eaves and 400 ft. long were used for the storing place. As their construction was the lightest and the cheapest possible, sacks of cement resting against the walls of the shed would bulge the walls out under the pressure. There would be considerable loss in cement caused by the breaking of weak sacks and some that would come untied.

The new system adopted for piling the sacks is shown in the accompanying sketch. Two tiers of sacks are built up at a time, the knots of the sacks overlapping, as shown in the plan, and the sacks laid flat. These double tiers are so bonded that they stand alone to a height of 10 ft. and should a sack become untied there is no waste of cement as it can be readily picked up, says the Cement Era. The ends of tiers are corded in such a way that no pressure comes against the sides of the shed, and an air space of from 4 to 6 in. is left between the cement and the walls. The

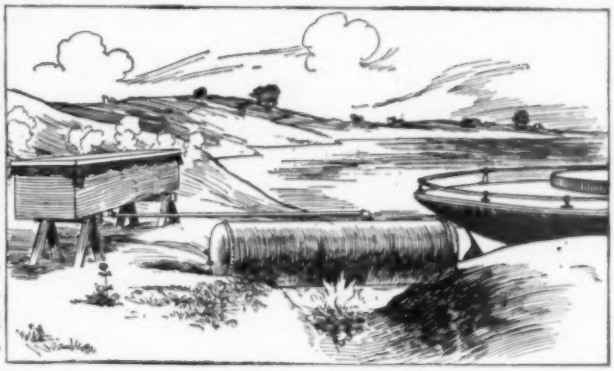


Method of Piling the Sacks

weight all comes on the floor, and a maximum quantity of cement can be stored in a minimum space.

Steaming Wood for Bent Work on Boats

Some of the pieces of wood must be steamed in order to bend them to the proper shape when building a new boat or repairing an old one. The accompanying illustration shows how a range boiler was placed across an excavation for a fireplace and used to generate steam for steaming the wood. A 1-in. pipe connects the boiler and box where the pieces of wood are placed to be steamed. Any old discarded boiler may be used so long as it is steam-tight. Fill extra holes with pipe plugs.

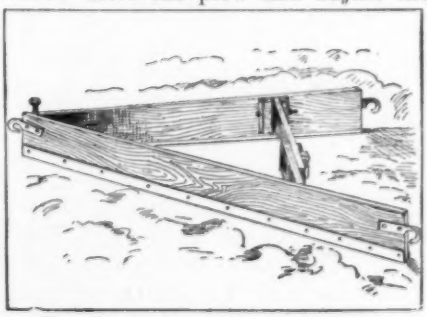


Steaming the Boards

Home-Made Road Grader

A simple form of a road grader is shown in the accompanying sketch. Two 2- by 12-in. oak plank 12 ft. long are hinged together at one end and held apart at the other by an adjustable device made from two pieces of 2- by 6-in. oak 6 ft. long. Band iron strips are bolted to the bottom edges of the plank. The grader is drawn by a team hitched to the hooks attached to both ends of the plank as shown.

When grading roads, follow in each furrow after the plow and adjust the center clamp so the dirt is moved to the place desired. After the road is graded hitch teams to the rear hooks, uncouple the front end and attach a chain so the opening will not be too wide and draw the grader over the center of the road. This will fill up the hollow places and work the dirt toward the center of the road.—Contributed by Charles H. Ensign, Payette, Idaho.



The Grader Has Adjustable Blades

Unfinished Hardwood Doors

A new house just completed should be thoroughly dried out by artificial heat before the rooms are fit for occupancy. As mortar contains large quantities of water the plastering must be thoroughly dried out before putting on the interior finish or there will be warped casings and doors. All wood is porous and the drier and more thoroughly seasoned wood will readily absorb any moisture. When an unfinished hardwood door is placed in a damp room it quickly absorbs the moisture and expands or swells, and when the wood again dries out the door is warped and twisted and the joints left open. After doors are hung and no more fitting to be done, the best plan is to cover the ends of the stiles, both top and bottom, with at least one coat of paint or varnish. This will prevent any moisture from entering the end pores of the wood.

Add a little powdered chalk to common glue to make the glue stronger.

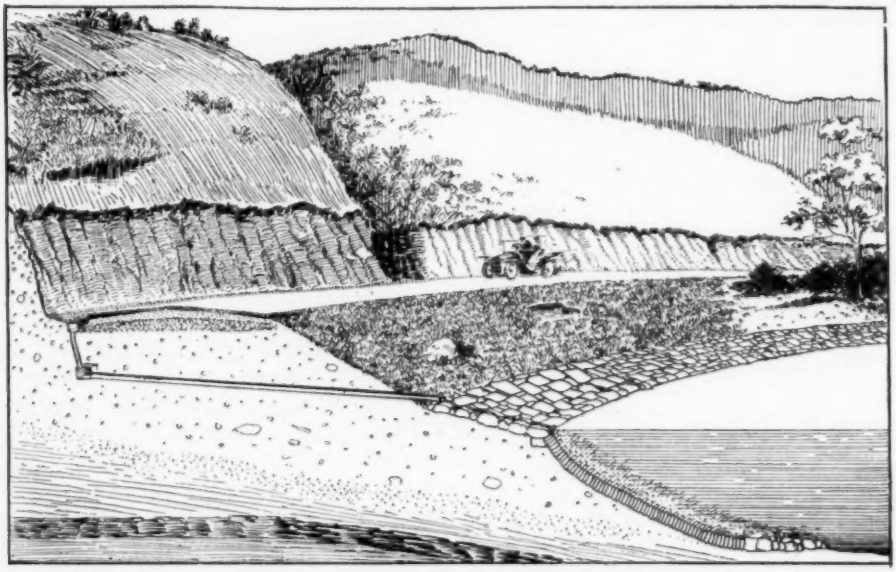
Road Embankments Along Streams

Embankments where roads traverse streams or lakes are subject to many destructive agents, and will not last long unless they are carefully and intelligently constructed.

Along rivers, and especially at bends, the current is continually carrying away loose soil, and is as continuously loosening more to carry along. In the spring the ice, breaking up, tears and cuts the banks as it passes along down the stream. This action takes place high up on the river bank at the spring high water mark. Bodies of moving ice in the lakes crowd the shores with great pressure, cutting the coast badly where the water is deep close up to the shore line. When a heavy sheet of ice is once set in motion by the wind or current it has stored up in it enormous power.

Above the high water mark of the stream, or along lakes above the line of wave action, the banks are cut by the surface water. But this should amount to very little if the surface water of the surrounding country is kept off the road. Water should not be allowed to stand in ditches by the side of the road, as it will finally seep under the road and get to the river, thus softening the foundation and causing washouts, says a correspondent of The Country Gentleman. Cast-iron or concrete culverts should be used, of sufficient size to carry off the water quickly.

The slope of the bank depends upon the material. When heaped up the side of a pile of earth forms a natural slope called the "angle of repose." The approximate angle of repose for different materials is given below, the ratio of slope being the proportion of the horizontal to the vertical:



Proper Protection for a River Road Bed

Material.	Angle Repose.	Ratio Slope.
Dry sand	30°	1.43 feet to 1 foot
Damp clay	45°	1.00 " " 1 "
Wet clay	15°	3.73 " " 1 "
Clayey gravel ...	45°	1.00 " " 1 "
Gravel	38°	1.28 " " 1 "
Firm loam	36°	1.38 " " 1 "
Vegetable	35°	1.43 " " 1 "

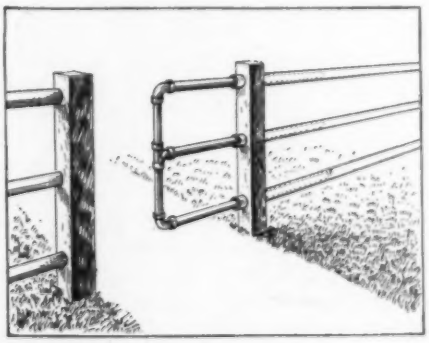
In practice the earth is put in at a trifle flatter slope than given above. Below the water line the slope should be still flatter, running as flat as 3½ to 1, and even 4 to 1. Earth under water has a much smaller angle of repose than the same earth above water, as shown in the table in regard to wet and damp clay.

From the high water line on the river bank, or wave line on the lake shore, down to the bottom of the slope, the bank should be protected by a layer of riprap or flat stones. If large stones are available they should be placed loosely along the bottom of the bank to afford some foundation for the riprap and to break the force of the current. Sometimes large stones are put in at the water line to catch the impact of the waves and ice. Where they are so placed it might be well to have very little slope just at the water line, as shown in the illustration.

Riprap may be laid in different ways, but the practical and really the only good method of putting in the stone is to place them with the long way of the stone at right angles to the slope of the bank. In this way the weight of each stone presses firmly against the bank, with the flat sides of the stones fitting solidly against each other.

A Gas Pipe Gate

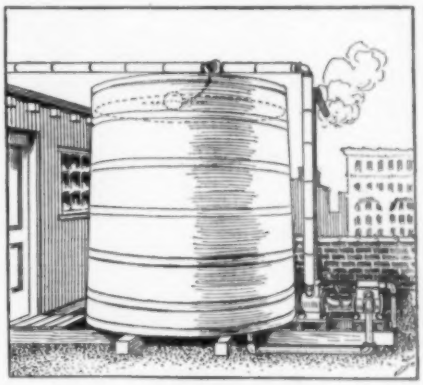
Where gas pipe or tubes are used for fencing a good construction of a gate is to use gas pipe and fittings. In this particular case, as shown in the cut, the gate was made from two ¾-in. ells, one ¾-in. tee and ¾-in. pipe cut in lengths to suit the opening. The fence was made from three 1½-in. tubes and the gate pipes slipped inside of them. The long pipes of the gate were made 2 ft. longer than the gate opening to keep the gate from sagging when closed.



Sliding Gas Pipe Gate

Throttle Valve Operated by a Float

The water supplied to a large woolen mill came from a tank that had to be kept full of water at all times. In order to have the steam pump start and

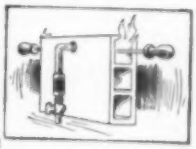


The Float Regulates the Water Level

stop without attention the steam supply pipe with the throttle valve was placed directly over the tank and the valve operated by a float. The throttle valve consisted of a steam cock with the lever of the float attached to the valve stem. The steam was only supplied to the pump when the water was below a certain level in the tank.

A Tile Soldering-Iron Heater

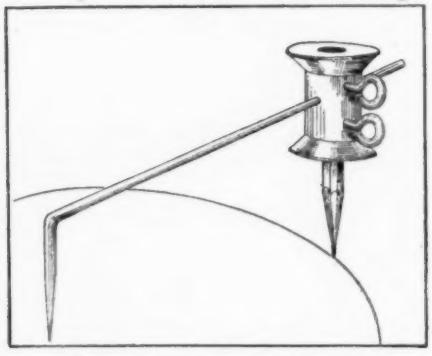
The accompanying sketch shows a soldering-iron heater for the shop. This heater is constructed from a common three section building tile. A hole is made in the side of the section for the flame from the gas burner to enter. Any number of sections in building tile may be used for this heater.



Dip a pine stick into plumbers' melted solder, remove the stick immediately and if it comes out scorched the solder is hot enough for ordinary purposes.

Home-Made Beam Compass

The main part or beam of this compass consists of a piece of $\frac{3}{16}$-in. wire with $3\frac{1}{2}$ in. of one end bent at right

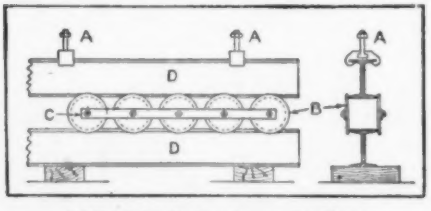


Made to Draw Any Size Circle

angles and filed to a point. A hole is bored through the side of an ordinary spool and two screw eyes fitted as shown in the illustration. One screw eye holds the pen or pencil and the other holds the spool on the wire. The wire can be cut to any length suitable for the work.

Extension Bed for a Planer

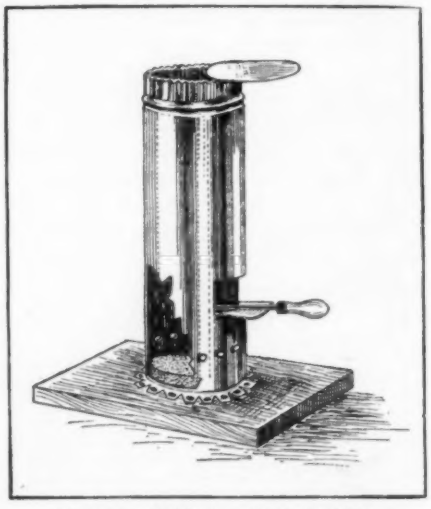
The accompanying sketch shows an attachment for a planer when planing long castings. The I-beams, D D, are placed on blocks parallel with the bed of the planer. Several flanged rollers, B, are placed in between the I-beams and kept at a certain distance apart by one $\frac{1}{2}$- by 2-in. iron bar, C, placed on each side of the rollers and a bolt run through each roller for an axle. The clamps, A, are used to fasten the casting to the top I-beam. This I-beam will move back and forth with the planer bed.—Contributed by Oscar Lewis, Oshkosh, Wis.



Will Hold Extra Long Castings

Home-Made Tinner's Charcoal Stove

The large end of a 5- or 6-in. ordinary stovepipe is cut so as to form three-cornered notches about 1 in. deep. The remaining parts of the metal are turned out and nailed to a board as shown in the illustration. The bottom part is filled with a 3-in. layer of clay and a few $\frac{1}{8}$-in. holes made in the metal just above the clay for the draft. Three sides of a rectangular piece, 2 in. wide and 3 in. long, are cut in the pipe and

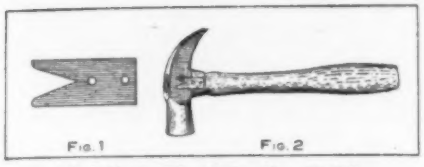


Charcoal Soldering Iron Heater

the metal within turned down. This forms the door and hearth for the soldering irons. A circular piece of metal laid over the top controls the draft.

A Nail Grip for Hammers

A carpenter often wishes to drive a nail at a point just a little higher than he can reach with both hands up. Sometimes a nail can be started and driven at a high point by holding the nail against one side of the hammer, clutching both nail and hammer in one hand, and striking the blow that will start the nail, but herewith illustrated is a device that will start a nail at a much higher point. A small piece of spring $\frac{3}{4}$ in. wide and 2 in. long is notched



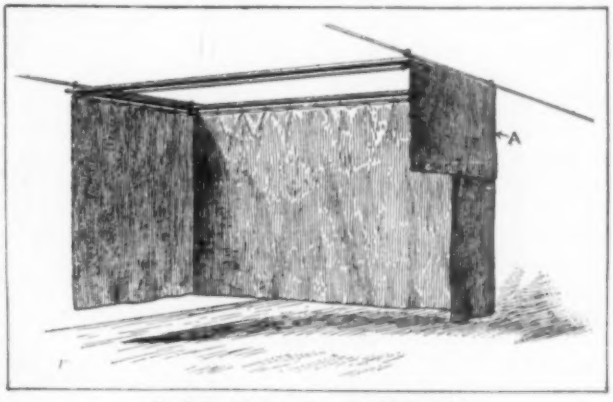
The Nail Fits Into the V-Clip

at one end in the shape of a V and fastened to the metal shank of the hammer with two rivets. The V-shaped notch will hold the head of the nail and the point out straight so the starting blow can be made by holding the hammer at the end of the handle.—Contributed by E. H. Grasing, Englewood, N. J.

An Automobile Cover

A cover that can be put in place over a car by one person without dragging the cloth on the ground or floor of the garage, is shown in the accompanying sketch. Two light steel ropes are fixed the length of the garage or place where the car is kept, and these are tightened with turnbuckles at one end. A very light frame of wood is then made just a little larger than the size of the car and is suspended from the steel ropes by four hoops, thus allowing the frame to travel the length of the garage, says the Automobile Dealer and Repairer. This frame is covered with cloth, which is allowed to extend over the sides and back of the frame and hang down far enough to cover the space between the frame and the side curtains. When the car is driven backward into the garage, the cover can be immediately pushed exactly over it with the aid of a stick.

On the under side of the frame light iron rods are fixed on the two sides and back, so that the back piece of the cover, which is fitted with rings at the top, can be suspended from the rod and is easily detachable for cleaning at any time. The sides are made like curtains, fitted also with rings at the top, and when unfastened from the front piece, A, they can be pushed up against the back wall of the coach house. They are buttoned to the back piece of the cover, and are made sufficiently wide to extend around the bonnet of the car, and be buttoned to the flap A, which is fixed to the front side of the traveling frame. This flap is brought down low enough for a man to button on the extensions of the side curtains, as shown, without using any steps. The illustration shows the car cover without the top covering of the frame with its overhanging part, to show the rods which carry the curtains at the sides and back.



Curtain Cover for an Automobile

Carbolic Acid as a Disinfectant

Pure carbolic acid is solid at ordinary temperatures and crystallizes in long white needles. It may be purchased in this form or as liquefied carbolic acid. The latter form is prepared by adding 1 part of water to 9 parts of the crystals and is employed by pharmacists on account of convenience in dispensing. Carbolic acid must not be confused with "crude carbolic acid" and "liquid carbolic acid."

For disinfecting purposes carbolic acid is generally used in watery solution, though powders containing it are

sold. A 5 per cent solution of crystallized carbolic acid in water is recommended for general use, for, although weaker solutions have been found efficient for destroying many nonspore-bearing bacteria, the conditions found in practice vary widely and in some cases hinder the action of the disinfectant. As carbolic acid dissolves slowly, the 5 per cent solution should be prepared with warm water, using care to see that all is dissolved before use. For disinfecting large surfaces a spray may be used, as the disinfectant should be applied liberally. Garments or implements to be disinfected should remain in the 5 per cent solution for at least one hour.

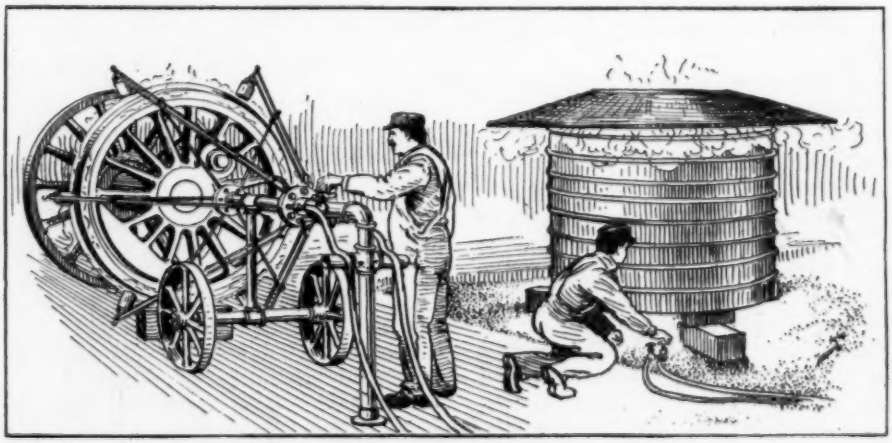
Crude Oil Tire Heaters

The Lehigh Valley Railroad company has recently introduced crude oil tire heaters at their system shops at Sayre, Pa., which have been found far superior to the former method of using gasoline and perforated rings for the application and removal of tires.

The heater for removing tires consists of six oil burners mounted on an adjustable frame, being able to adjust the burners to any desired diameter. The frame consists of an arrangement of wrought-iron pipe mounted on a pair of wheels. On the main part of the frame a combination air and oil chamber is arranged to slide forward and back, and, in conjunction with a six-point star, the various adjustments of the burners are produced. On the front side of the supply chamber six ball-joint connections are made to the oil supply, also six connections are made to connect the air supply with the burners and piping arranged to connect the burners with the supply chamber.

When using gasoline for removing tires two men would use from 20 to 50 minutes in removing a tire, while with this heater from 7 to 11 minutes are required. While the old tires are being removed new ones are piled up on three cast-iron blocks and a large crude oil burner is placed underneath, the burner having the capacity to fill the inside of eight tires with flame and heat them for application in 20 minutes. Inasmuch as both heaters are comparatively smokeless, there is perfect satisfaction. During a test six old tires were removed and six new tires were applied in 1 hour and 52 minutes.—Contributed by J. M. Hamm, Machine Foreman, Sayre, Pa.

If a large hole is to be soldered in tin or enameled ware, hold several sheets of paper over the hole on the opposite side from where the soldering is done and the solder will bridge over and cover the hole.

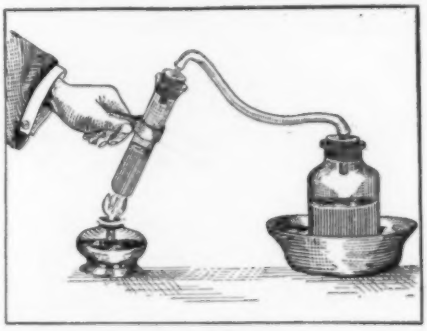


Removing Engine Wheel Tires

Amateur Mechanics

How to Make a Simple Still

A still to distill water can be made from a test tube, some heavy rubber hose and an ordinary bottle. Secure a stopper for the test tube, and bore a hole through the center, into which fit a small hollow tube. The bottle is also fitted with a stopper containing a hollow tube, and both bottle and test tube connected with a hollow rubber tube. The test tube is partially filled with water and supported or held over an alcohol lamp. The bottle should stand in a basin of cold water. When the

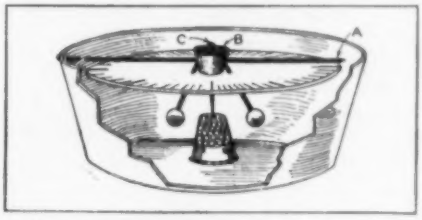


Distilling Water

water in the test tube begins to boil the steam passes over to the bottle, where it condenses. The basin should be supplied with cold water as fast as it begins to get warm. The rubber tube will not stand the heat very long and if the still is to be used several times a metal tube should be supplied to connect the test tube and bottle.

Home-Made Mariner's Compass

Magnetize an ordinary knitting needle, A, and push it through a cork, B, and place the cork exactly in the middle of the needle. Thrust a pin, C, through the cork at right angles to the needle and stick two sharpened matches in the sides of the cork so they

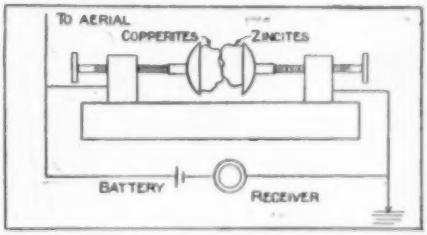


Magnetized Needle Revolving on a Pin

will project downward diagonally. The whole arrangement is balanced on a thimble with balls of wax stuck on the heads of the matches. If the needle is not horizontal, pull it through the cork to one side or the other, or change the wax balls. The whole device is placed in a glass berry dish and covered with a pane of glass.

Quartz Electrodes Used in Receiving Wireless Messages

Wireless messages have been received at Washington, D. C., from Key West, Florida, a distance of 900 miles through a receiving instrument in which two pieces of quartz of different composition were used on the electrodes. In making an instrument of this kind the quartz can be purchased from a dealer in minerals of which one piece must contain copperites and the other zincites. The electrodes are made cupping to hold the minerals and each to have a screw adjustment to press the quartz in contact with each other. The connections are made as



Details of the Receiving Instrument

shown in the illustration, using a high resistance receiver.—Contributed by Edwin L. Powell, Washington, D. C.

How to Make a Glider

By Carl Bates

A gliding machine is a motorless aeroplane, or flying-machine, propelled by gravity and designed to carry a passenger through the air from a high point to a lower point some distance away. Flying in a glider is simply coasting down hill on the air, and is the most interesting and exciting sport imaginable. The style of glider described in this article is known as the "two-surface" or "double-decked" aeroplane, and is composed of two arched cloth surfaces placed one above the other.

In building a glider the wood material used should be straight-grained spruce, free from knots. First prepare from spruce planks the following strips of wood. Four long beams $\frac{3}{4}$ in. thick, $1\frac{1}{4}$ in. wide and 20 ft. long; 12 crosspieces $\frac{3}{4}$ in. thick, $\frac{3}{4}$ in. wide and 3 ft. long; 12 uprights $\frac{1}{2}$ in. thick, $1\frac{1}{2}$ in. wide and 4 ft long; 41 strips for the bent ribs $\frac{3}{16}$ in. thick, $\frac{1}{2}$ in. wide and 4 ft. long; 2 arm sticks 1 in. thick, 2 in. wide and 3 ft. long; the rudder sticks $\frac{3}{4}$ in. square and 8 ft long; several strips $\frac{1}{2}$ in. by $\frac{3}{4}$ in. for building the vertical and horizontal rudders. The frames for the two main surfaces should be constructed first, by bolting the crosspieces to the long beams at the places shown by the dimensions in Fig. 1. If 20-ft. lumber cannot be procured, use 10-ft. lengths and splice them, as shown in Fig. 3. All bolts used should be $\frac{1}{8}$ in. in diameter and fitted with washers on both ends. These frames formed by the crosspieces should be braced by diagonal wires as shown. All wiring is done with No. 16 piano wire.

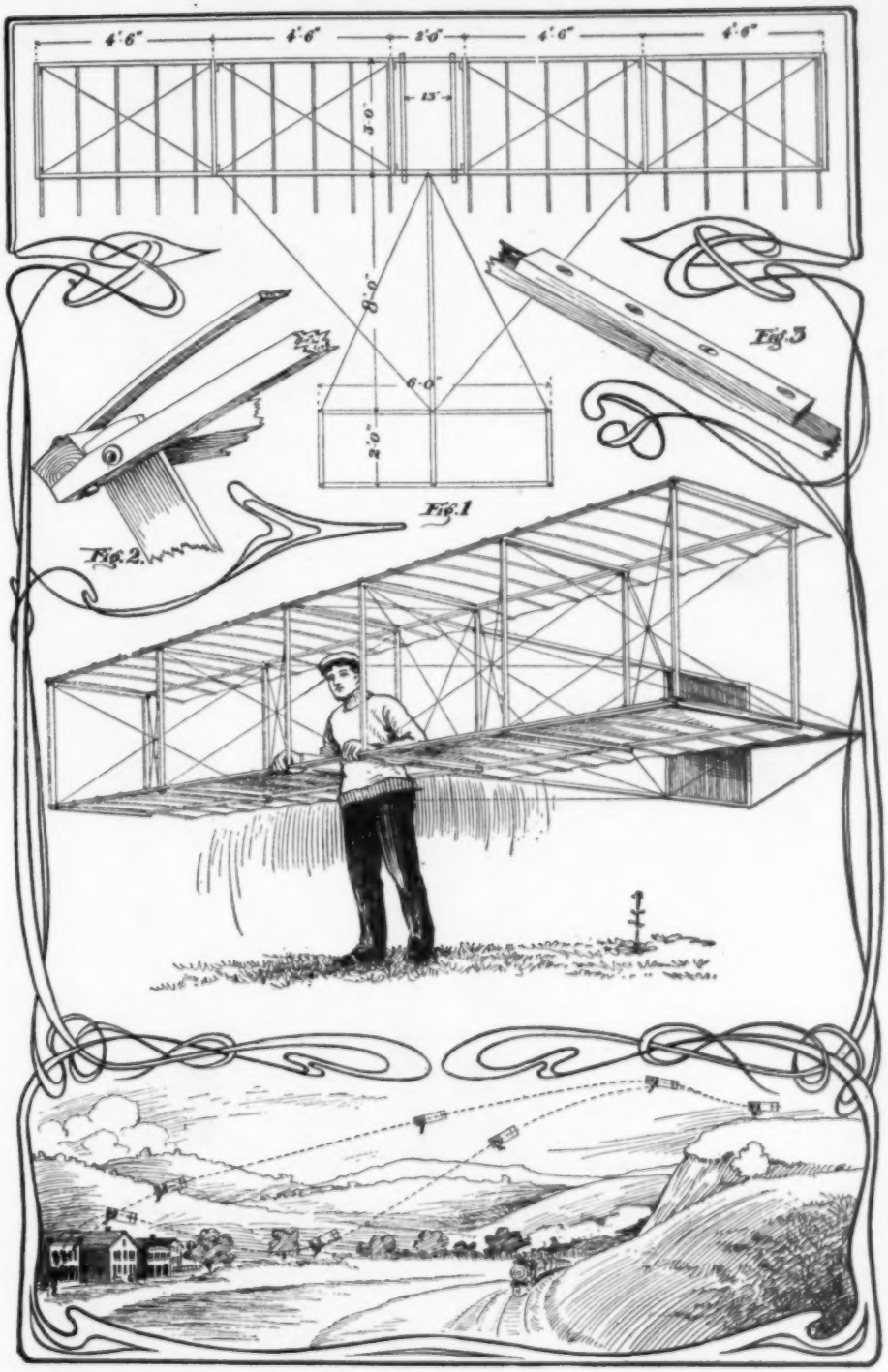
The 41 ribs may be nailed to the main frames on the upper side by using fine flat-headed brads $\frac{7}{8}$ in. long. These ribs are spaced 1 ft. apart and extend 1 ft. beyond the rear edges of the main frames, as shown in Fig. 1. After nailing one end of a rib to the front long beam, the rib is arched by springing down the loose end and nailing to the rear beam. The ribs should have a curve as shown in Fig. 2, the amount of curvature being the same in all the ribs.

The frames of the main surfaces are now ready to be covered with cloth. Cambric or bleached muslin should be used for the covering, which is tacked to the front edge, stretched tightly over the bent ribs and fastened securely with tacks to the rear ends of the ribs. The cloth should also be glued to the ribs for safety. In the center of the lower plane surface there should be an opening 2 ft. wide and 4 ft. long for the body of the operator. Place the two main surfaces 4 ft. apart and connect with the 12 uprights, placed in the corner of each crosspiece and beam. The uprights are fastened by bolting to the crosspieces, as shown in Fig. 2. The whole structure is made strong and rigid by bracing with diagonal wires, both laterally and longitudinally.

The vertical rudder is to keep the machine headed into the wind and is not movable. This rudder is made of cloth stretched over a light wooden frame, which is nailed to the rudder sticks connecting to the main frame. The horizontal rudder is also made of cloth stretched over a light wooden frame, and arranged to intersect the vertical rudder at its center. This rudder is held in position and strengthened by diagonal wires and guy wires. The horizontal rudder is also immovable, and its function is to prevent the machine from diving, and also to keep it steady in its flight. The rudders are fastened to the glider by the two rudder sticks, and these sticks are held rigid by diagonal wires and also by guy wires leading to the sides of the main frames as shown in Fig. 1. The two arm sticks should be spaced about 13 in. apart and bolted to the long beams in the center of the opening in the lower plane where the operator is to take his position.

The glider should be examined to see

that the frame is not warped or twisted



Details of the Glider

that the frame is not warped or twisted. The surfaces must be true or the machine will be hard to balance when in flight. To make a glide, take the glider to the top of a hill, get in between the arm sticks and lift the machine up until the arm sticks are under the arms as shown, run a few steps against the wind and leap from the ground. You will find that the machine has a surprising amount of lift, and if the weight of the body is in the right place you will go shooting down the hillside in free flight. The landing is made by pushing the weight of the body backwards. This will cause the glider to tip up in front, slacken speed and settle. The operator can then land safely and gently on his feet. Of course, the beginner should learn by taking short jumps, gradually increasing the distance as he gains skill and experience in balancing and landing.

The proper position of the body is slightly ahead of the center of the planes, but this must be found by experience. The machine should not be used in winds blowing faster than 15 miles an hour. Glides are always made against the wind, and the balancing is done by moving the legs. The higher the starting point the farther one may fly. Great care should be exercised in making landings, otherwise the operator might suffer a sprained ankle or perhaps a broken limb. The illustration shows two lines of flight from a hilltop, the glider travels on the upper line caused by the body of the operator taking a position a little back of the proper place, and on the lower line he changes his position from front to back while flying, which causes the dip in the line.

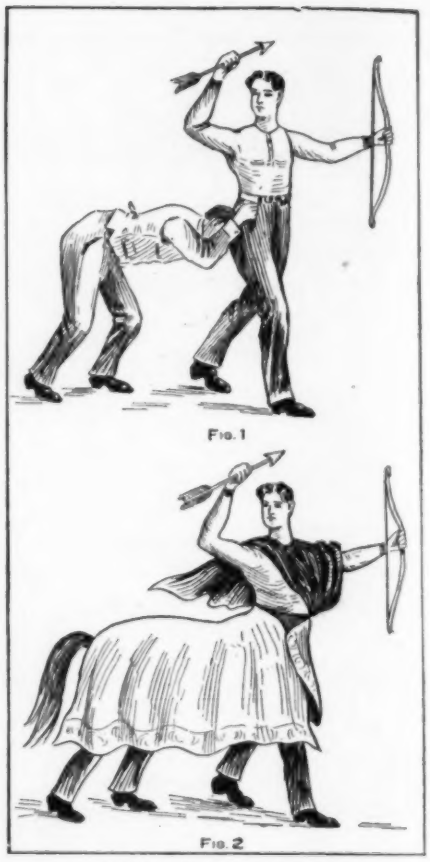


Fig. 1

Fig. 2

Making Up the Centaur

Boys Representing the Centaur

This is a diversion in which two boys personate a Centaur, a creature of Greek mythology, half man and half horse. One of the players stands erect and the other behind him in a stooping position with his hands upon the first player's hips, as shown in Fig. 1. The second player is covered over with a shawl or table cover which is pinned around the waist of the first player. A tail made of strips of cloth or paper is pinned to the rear end of the cover. The first player should hold a bow and arrow and have a cloak thrown loosely over his shoulder as shown in Fig. 2. Imitation hoofs of pasteboard may be made and fastened over the shoes.

Home-Made Ladle for Melting Babbitt

Secure a large sized old bicycle bell and rivet a heavy wire or strap iron on one side for a handle. When heated a little, hammer out the edge on one side for a lip to pour from. This makes a good ladle for melting small amounts

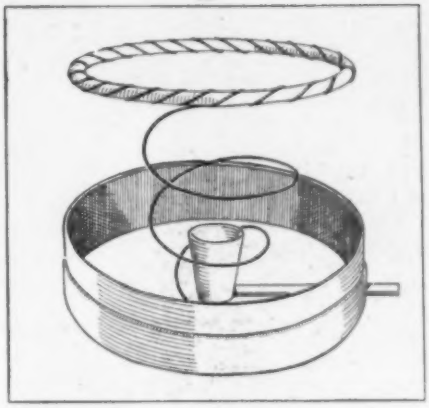
of babbitt or lead.—Contributed by L. M. Olson, Bellingham, Wash.

How to Make a Flash Lamp

Indoor photographs are made much better with the use of a flashlight than by depending on light from windows. The lighting can be made from any direction to suit the operator. If lighting flash powder when not in a regular flash lamp the flash cannot be depended upon and in some instances is dangerous. To make a simple and inexpensive flash lamp, first secure from your druggist an empty salve box about 3 in. in diameter. While at the drug store get 3 ft. of small rubber tubing; this will cost about 15 cents. Now visit the tin shop and get a small piece of scrap tin 3 or 4 in. square; a piece of brass or steel wire, about the size of stove pipe wire, 14 in. long. These with a strip of light asbestos paper and some small iron wire, about the size of door screen wire, will complete the material list.

Carefully punch a hole through the salve box on one side near the bottom with a 10-penny nail. Cut a strip of tin 2 in. long and about $\frac{3}{8}$ in. wide and roll this around an 8-penny nail so as to form a small tube which will just fit the hole made in the salve box. Next roll up a strip of tin $\frac{1}{2}$ in. wide into a small cup about $\frac{3}{8}$ in. in diameter at one end and $\frac{1}{4}$ in. at the other.

Place the tube in the nail hole so that one end comes almost to the center of the box inside and the other end projects about $\frac{1}{2}$ in. outside the box. Cut out a little place for the tube to enter the cup at the small end and then solder the tube and cup to the bottom of the box as shown in the illustration. The tube and cup should be well soldered on the seams to make them airtight. Bend a ring on one end of the larger piece of wire, making it $2\frac{1}{2}$ in. in diameter and form the remaining portion of the wire into a spiral, soldering the end in the bottom of the box near the cup. Wrap the ring at the top of the spiral piece of wire all the way around with the strip of asbestos paper, wrapping them together over and over until the entire ring is covered. Slip the end of the rubber tube over the tin tube on the side of the box and the flash lamp is complete.



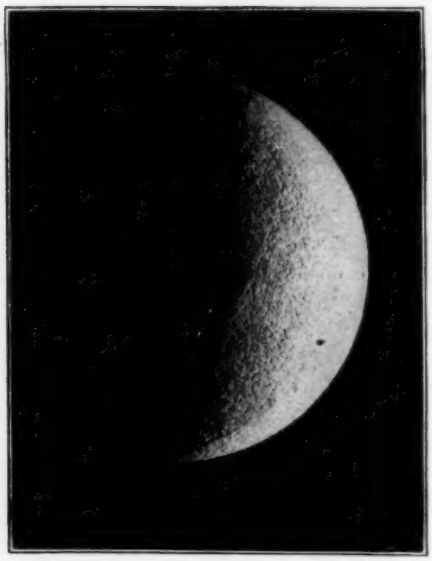
Made from a Tin Salve Box

To make a flash with this lamp fill the little cup in the center with flash powder and moisten the asbestos ring with alcohol. When all is ready for the picture the alcohol is lighted and a quick blow of the breath through the rubber tube will force the flash powder upward into the flame and cause the flash.

When through with the lamp place the cover over it, pushing the asbestos ring down inside the box. Wind the rubber tubing around the box and you have a neat outfit that can be carried in the pocket.

Photographing the New Moon

To make a photograph of the moon is quite difficult and no good picture can be made without an expensive apparatus. At home and with your own hand camera you can make a good picture of the new moon by the use of a flash light on a tennis ball, the tennis ball taking the part of the moon. The ball is suspended in front of a black cloth screen, the camera focused by holding a burning match near the ball and the exposure made by burning a



Tennis Ball Photographed

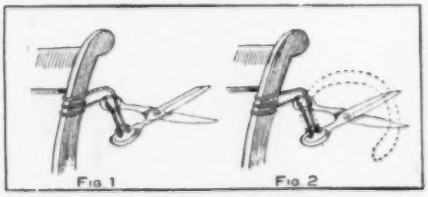
small quantity of flash powder at one side and a little below the ball. The light from the flash only striking one side of the ball gives the effect of the new moon.—Photo by M. M. Hunting, Dayton, O.

Old-Time Magic—Part II

Removing Scissors from a Cord

A piece of strong cord is doubled and fastened to a pair of scissors with a slip knot, as shown in Fig. 1. After passing the ends of the cord through the thumb hole of the scissors they are tied fast to a chair, door knob or any other object that may be of sufficient size to make the ends secure. The trick is to release the scissors without cutting the cord.

Take hold of the loop end of the cord in the lower handle and drawing it first through the upper handle and then completely over the blades of the scissors, as shown in Fig. 2. This is very simple when you know how, but puzzling when the trick is first seen.



How the Scissors Are Removed

Coin and Card on the First Finger

This is a simple trick that many can do at the first attempt, while others will fail time after time. It is a good trick to spring upon a company casually if you have practiced it beforehand. A playing card is balanced on the tip of the forefinger and a penny placed on top immediately over the finger end, as shown in the sketch. With the right-hand forefinger and thumb strike the edge of the card sharply. If done properly the card will fly away, leaving the penny poised on the finger end.

How to Make Sealing Wax Hat Pins

Select a stick of sealing wax of the desired color for the foundation of the hat pin. Hold the end of the stick over a flame until the wax is soft enough to drop; then put it on the hat-pin head. When sufficient wax has adhered to the pin, hold the lump over the flame, revolving the pin at the same time so the wax will not drop and the head will form a round ball. The head can be made in any shape desired while warm. When the desired shape has been obtained, cool thoroughly in cold water and dry carefully.

Stripes and designs may be put on the foundation by applying drops of other brilliant colored wax, and by careful manipulation the wax when warm can be made to flow around the pin head and form pretty stripes and designs. If a certain color is to be more prominent, the wax to make this color must be applied last and the pin put through the flame again. Cool in water and dry, as before, and pass once more through the flame to obtain the lustre.

BUTTON MATCHER.—This device, patented by a Chicago inventor, is designed to aid in the matching of buttons. The buttons are sewed upon the supports spanning the openings. In matching a button, the board is placed upon the cloth, the openings revealing enough of the material to make possible an accurate comparison with the buttons. (Fig. 1.)

VIOLIN WITH HORN ATTACHMENT.—A curious musical instrument, fashioned after a violin but provided with horns not unlike those of a phonograph, has been patented by a musician in Prague, Okla. Sound boxes are connected to the strings of the instrument, and it is from these that the two horns lead. One of the horns lies straight along the body of the instrument and the other inclines outwardly. The idea of the horns is to add to the volume of the music. (Fig. 2.)

LOCK ATTACHMENT FOR MILK BOTTLES.—The possibility of having the early delivery of milk stolen by thieving cats or tramps is provided against by this milk-bottle lock. It is screwed to the window sill, and when the neck of the bottle is pressed into the arm it locks automatically and holds the bottle secure. (Fig. 3.)

SWEATERS FOR DOGS.—The dog sweater is a welcome addition to the already long list of dog furnishings, especially for any dog that lives in a college town. The sweaters are made in various colors to suit the taste of customers. (Fig. 4.)

TELEPHONE RECEIVER FOR LENGTHY TRANSACTIONS.—Holding an ordinary telephone receiver to the ear when the conversation over the wire is a lengthy one is tiring, but with this arrangement both hands are left free and the ear cups rest solidly in place. The steel holder slips over the head. (Fig. 5.)

INGENIOUS HOT-DRINK SIGN.—The illustration shown in Fig. 6 is an ingenious sign for advertising hot drinks. It consists of a cup and saucer connected to a source of steam supply by a pipe, this pipe also acting as a support. The steam rises from the cup as long as the supply of steam is left open.

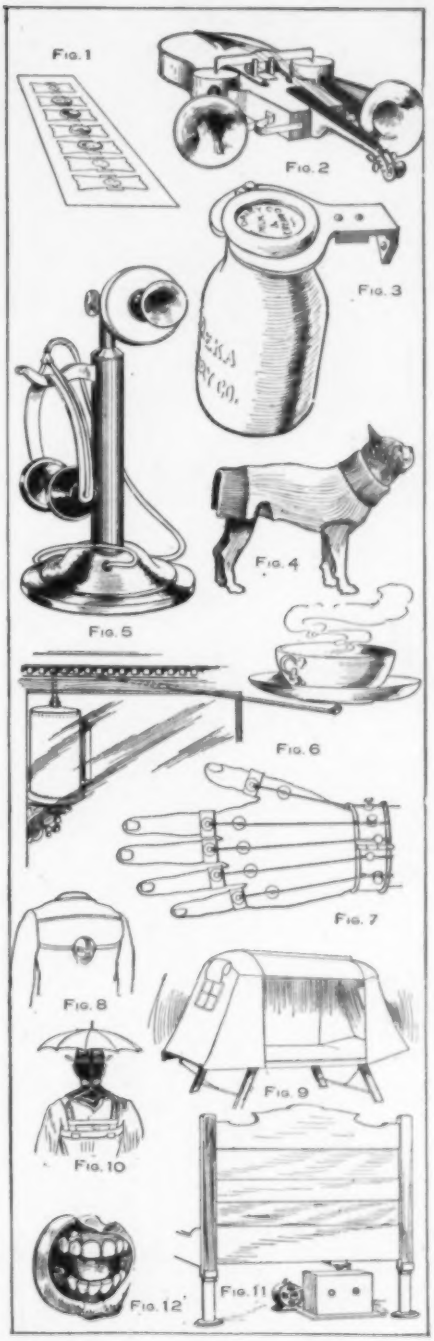
FINGER-DEVELOPING HARNESS.—Figure 7 is an appliance designed to strengthen the muscles of the fingers, and is the invention of a Mexican. It consists of a steel or leather wristband to which are attached five steel rods which run over the back of the hand to the base of the fingers. At the ends of these rods are rings that slip over the fingers and thumb, and upon these rings are secured small, detachable weights. These weights rest just forward of the first joints of the hand, and on the rods just back of these joints is another set of weights. The weights offer resistance to the muscles when the fingers are moved, thus developing them.

ANTI-SNORING DEVICE.—The ball attachment shown in Fig. 8 was recently patented as an anti-snoring device. It is fitted with a strap or harness which holds it just between the shoulder blades, and awakens the wearer should he lie upon his back. The ball is of the hollow, compressible type.

TENT-COT FOR MANY PURPOSES.—The tent-cot shown in Fig. 9 is something new in the line of camp supplies. The cot frame is of hard maple, and the covering of the cot, as well as the canopy or tent, is of brown duck. The openings at the side and ends are provided with adjustable flaps, which may be raised or lowered as the occupant desires. The whole outfit folds compactly and does not exceed over 30 lb. in weight.

SUNSHADE FASTENS TO SHOULDERS.—A little more than a year ago this magazine published an illustration of a German sunshade which fastens to the shoulders and leaves the hands free for work or pleasure. This sunshade, patented by a Texas inventor, embodies the same idea, but in this instance the sunshade is of the ordinary design, while the German invention consisted of a steel frame over which a piece of cloth was stretched in gable form. (Fig. 10.)

AN ELECTRICALLY VIBRATED BED.—The electric vibrator as a producer of health and vigor is too well advertised to need reiteration here. A large number of electric vibrators to be used directly upon the body or to be attached to chairs have been patented and placed upon the market, and to this list is added the bed vibrator shown in Fig. 11. The bed is equipped with spring legs, and is vibrated by means of a motor placed at the foot.



LIP PROTECTOR FOR DENTAL WORK.—The lip-protector shown was patented by a Wisconsin inventor, and is designed for use in dental work. It is crescent shaped, and when placed in position holds the lips back from the teeth. (Fig. 12.)

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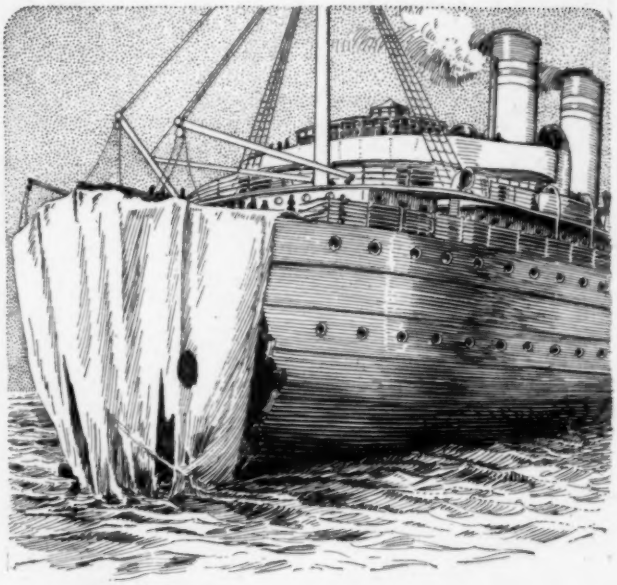
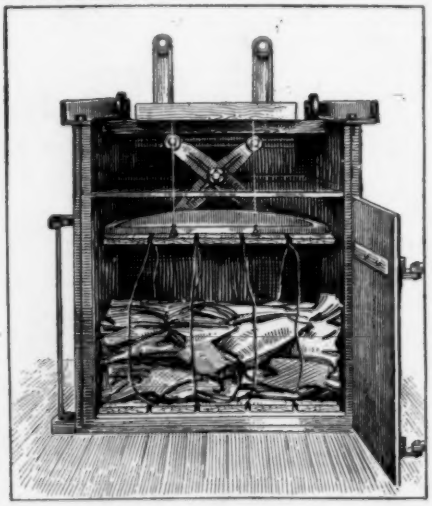
CRUSHED BOW OF THE "FLORIDA"

The damage sustained by the Lloyd Italiano Co.'s "Florida" when she rammed the White Star liner "Republic," eventually sinking her after a dramatic interplay of wireless messages which brought aid to passengers and crew, is clearly shown in this photograph, taken after she had limped into port. The bow was crushed in like an egg shell, the bulkheads alone saving her from meeting the same fate as the "Republic."



SAVE AND SELL WASTE PAPER

Waste paper is no inconsiderable item in the receipts of a large office building, but in many instances, especially in the smaller cities, it is given away, and in the majority of instances in which it is handled by the building managers for a profit, only a few proceed in a scientific and thoroughly modern manner.



Hand-Baling Press for Waste Paper

Waste paper, stuck into a bin or room every night and sold loosely at the end of a week only brings from 20 to 25 cents per 100 lb., to say nothing of the fire danger from such a method. The modern method is to install a small hand-baling press in the basement, or, if the building is a busy one, a larger press. The size of press which seems the most popular has a capacity of about 300 lb. As fast as the waste paper is received it is dumped into the press and kept there until enough is accumulated to make a bale. The lever is then applied and a neat, compact bale is the result. Baled waste paper brings from 30 to 50 cents per 100 lb.

The manager of a paper company in Chicago estimates that $500,000 worth of old paper is taken from the waste paper baskets in that city every year. Chicago waste baskets are relieved of 300 tons of paper every night. In some of the larger downtown structures as much as $20 per day is thus realized, but in many of the smaller buildings the waste paper is burned in the furnaces.